VOL. LXXXII. No. 2114. [All Rights Reserved.] JUL 2 MAY 31, 1918. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C. 4. SUBSCRIPTION per annum, Postage inclusive, in Great Britain, £1 1s. 6d. Canada, £1 3s. [illegible] to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOYVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
Telegraphic Address: "Ageekay, Cent., London." A B C Code. Telephone Nos. City 997; Central 4425 (Editorial only).

LITHOLITE, Ltd.,
55—57, Hackney Grove, London, E. 8.
'Phone and Telegrams: Dalston 592, London.
MANUFACTURERS OF
MOULDED INSULATORS,
FIREPROOF AND OTHER GRADES.
ESTABLISHED NEARLY 20 YEARS.

SILUMINITE.
Fireproof—Non-Hygroscopic—High Resistant.
The New low priced British Insulating Material having qualities and characteristics possessed by no other Insulating Material. Used by the Government and leading Railways, and Electrical Firms.
THE SILUMINITE INSULATOR CO., Ltd.,
The Green, Southall, Middlesex.
'Phone: Southall 59. See Large Advt. every alternate week.

T. H. FERGUSON, PAILIN & Co., LIMITED, A. C.
SWITCHBOARDS.
L. T. EDWARD ST., Hy. Openshaw, MANCHESTER. Tel.: 330 Openshaw. D. C.

INSTRUMENTS, CIRCUIT-BREAKERS,
AUTO-CUT-IN & CUT-OUTS.
THE Record Electrical Co., Ltd.,
BROADHEATH, MANCHESTER.
TELEPHONE: 164 ALTRINCHAM.

A.C. MOTORS.
E. BROOK, LTD.,
11, Queen Victoria Street, LONDON, E.C. 4.
49, Basinghall Street, LEEDS.
Empress Works, HUDDERSFIELD.
See Advertisement, Sup. 30.

SWITCHGEAR.
ERNEST F. MOY, LTD.,
Manufacturing Electrical Engineers and Government Contractors.
GREENLAND PLACE, CAMDEN TOWN, LONDON.

NEW DISTRIBUTION BOXES.
THE CANTIE PATENT FUSE WILL CLEAR A "DEAD SHORT."
ALL CONNECTIONS FROM FRONT.
THE CANTIE SWITCH CO., LTD.,
67, MOUNT ST., NOTTINGHAM.

THE SAXONIA
ELECTRICAL WIRE CO., LTD.,
ALWAYS GREENWICH, S.E.
ALL BRITISH
FLEXIBLE CABLES.

CHURTON
SINGLE and POLYPHASE
MOTORS.
T. HARDING CHURTON & CO., LTD.,
Atlas Works, Water Lane, LEEDS.

LIFTS and - - -
TRANSPORTERS.
Wm. WADSWORTH & SONS, LTD.,
BOLTON.

"EMPIRE"
AUTOMATIC CONTROL
FOR
Shell Presses, Compressors, Machine Tools.
ELECTRIC CONTROL, LIMITED, GLASGOW.

WESTERN-ELECTRIC
COMPANY, LIMITED,
Norfolk House, Victoria Embankment, W.C.
Works: NORTH WOOLWICH, LONDON, E.
TELEPHONES & CABLES.
See Advertisement this week, p. xxix.

CONNOLLY BROS., Ltd.,
for
WIRES AND CABLES.
See Advertisement last week, p. iii.

WIRES & CABLES.
THE
WHOLESALE ELECTRICAL CO., LTD.,
54/56, Oxford Street, London, W.
'Phone: Museum 1897.

METER DIALS,
Switchboard Labels, Name Plates, Instruction and Address Plates, Advertising Novelties, Club Badges, Checks, Tokens, Blanks, Die Stampings, Dies, Press Tools, Punches, and Cutters.
RELIANCE Engraving Co., Ltd., CHISWICK.

JULIUS SAX
FOR
ACCESSORIES.
Over 50 years' experience.

Write to
JOHNSON & PHILLIPS, LTD.,
CHARLTON, LONDON, S.E. 7,
for Descriptive Booklet, S2/1—4, "All Steel Draw-out Truck Type Switchboards."

Glasgow Office: 68, Gordon St.
OPENSHAW, DYNAMOS & MOTORS ELECTROMOTORS, Ltd. MANCHESTER.
London Office: 49, Queen Victoria St., E.C. 4.

START LIGHT.
THE
WOODHOUSE AUTOMATIC CLUTCH
PICKS UP LOAD AFTER STARTING.
THE VICTORIA DYNAMO & MOTOR CO.,
CRAVEN HOUSE, KINGSWAY, W.C. 2

MAVOR & COULSON, Ltd.,
GLASGOW.
MOTORS, DYNAMOS, SWITCHGEAR.

FLEXIBLE COUPLINGS
Prompt Delivery.
THE POWER PLANT CO., LTD., West Drayton, Middlesex.

THERMIT, LIMITED,
(Proprietors: THE BIRMINGHAM METAL & MUNITIONS CO., Ltd., BIRMINGHAM)
675, Commercial Road,
LONDON, E. 14.
'Phone: EAST 4157. 'Grams: "FULMEN, STEP, LONDON."

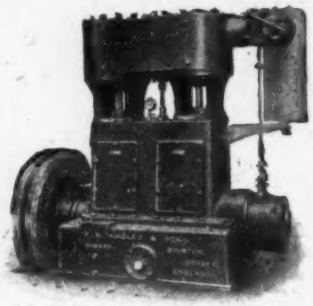
LEA RECORDERS
for measuring
Boiler Feed Water
and Condensed Steam.
The LEA RECORDER CO., Ltd., Deansgate, Manchester

M·E·M IRONCLAD SWITCHGEAR.
Peculiarly well-meriting your keen confidence. British make throughout, supreme simplicity and efficiency, and low price — provide proofs. List sent on request to
MIDLAND ELECTRIC MFG. CO., LTD.,
Barford Street, BIRMINGHAM.

Advertisement Index, see page xxviii.

VERTICAL ENCLOSED HIGH SPEED STEAM ENGINES.

SIMPLE AND COMPOUND.



For Direct Coupling to Dynamos, Fans, Pumps, &c.

For Ship Lighting and Industrial Works of all kinds.

E. S. HINDLEY & SONS,

11, Queen Victoria Street, E.C. 4.

Works: BOURTON, DORSET. Telephone: City 9804. Telegrams: "Steamport, Cannon."

THE

TUDOR ACCUMULATOR

COMPANY, LIMITED.

NOW ENTIRELY BRITISH

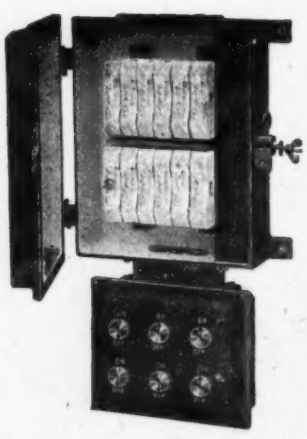
3, Central Buildings,
Westminster, S.W. 1.

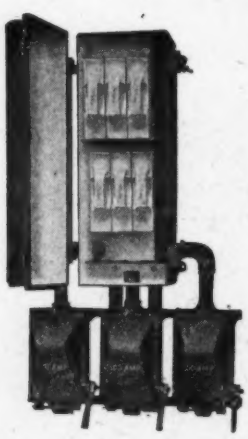
TELEPHONE: VICTORIA 2600.

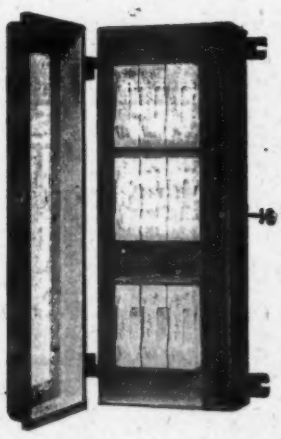
TELEGRAMS: "SUBCONICAL, LONDON."

Works: DUKINFIELD, near MANCHESTER.

EXAMPLES OF DONOVAN'S "SAFUSE" POWER AND LIGHTING BOARDS.







Designs prepared and Estimates submitted for Switch and Fuse Gear suitable for any situation where SAFETY and EFFICIENCY are the first considerations.

Guaranteed to comply with Home Office Regulations.

DONOVAN & CO., Patentees and Sole Manufacturers, **47, Cornwall St., BIRMINGHAM.**

THE

ELECTRICAL REVIEW.

VOL. LXXXII. MAY 31, 1918. No. 2,114.

ELECTRICAL REVIEW.

Vol. LXXXII.] CONTENTS: May 31, 1918. [No. 2,114.

	Page
The President and the Press	505
The Enemy in Trade	506
Clinker Dams, by C. M. Bennett (*illus.*)	507
A British Ideal for Manufacturers, by "Imperial"	508
Lubrication and Electrical Plant, by G. Basil Barham ...	509
Extensions at Chesterfield Electricity Works (*illus.*)	510
Correspondence—	
Industrial Combination	511
A Question of Competition	511
Resistance-Temperature Coefficient of Copper	511
The Institution of Electrical Engineers	511
Trading with the Enemy	512
War Items	514
Import Trade of China	514
Legal	515
Business Notes	515
Notes	518
City Notes	521
Stocks and Shares	524
Some Transient Phenomena in Electrical Supply Systems, by Prof. E. W. Marchant (*illus.*)	525
Foreign and Colonial Tariffs on Electrical Goods	528
New Patents Applied for, 1918	528
Abstracts of Published Specifications	528
Contractors' Column ... ... Advertisement page xxii	

THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGEREAY, CENT., LONDON." Code, A B C
Telephone Nos.: City 307; Central 4425 (Editorial only).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

Subscription Rates.—Per annum, postage inclusive, in Great Britain, £1 1s. 2d.; Canada, £1 2s. 10d. ($5.80). To all other countries, £1 10s.

FOREIGN AGENTS:

ADELAIDE: Messrs. Atkinson & Co., Gresham Street.
AUCKLAND N.Z.: Gordon & Gotch, Albert Street; Peter G. Tait, P.O. Box 392.
BRISBANE: Gordon & Gotch, Queen St.
CHRISTCHURCH, N.Z.: Gordon and Gotch, Manchester Street.
DUNEDIN, N.Z.: Gordon & Gotch, Princes Street.
JOHANNESBURG, CAPETOWN, BLOEMFONTEIN, DURBAN, PORT ELIZABETH, &c.: Central News Agency, Ltd.
LAUNCESTON: Gordon & Gotch, Cimitiere Street.
MELBOURNE: Peter G. Tait, 90, William Street; Gordon & Gotch, Queen Street.
MILAN: Fratelli Treves.
NEW YORK: D. Van Nostrand, 25, Park Place.
PARIS: Boyveau & Chevillet, 22, Rue de la Banque.
PERTH, W.A.: Gordon & Gotch, William Street.
ROME: Loescher & Co., Corso Umberto 1° 307.
SYDNEY: Peter G. Tait, 273, George Street; Gordon & Gotch, Pitt Street.
TORONTO, ONT.: Wm. Dawson & Sons, Ltd., Manning Chambers; Gordon and Gotch 132, Bay Street.
WELLINGTON, N.Z.: Gordon & Gotch, Cuba Street.

Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, and crossed "London City and Midland Bank, Newgate Street Branch."

NOTICE TO READERS.

In view of Orders shortly to be issued by the Paper Controller, readers are urged to place a definite order with their newsagents for regular supply of the ELECTRICAL REVIEW weekly. In the event of difficulty arising in so doing, a subscription rate order should be forwarded direct to these offices, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4. If one or other of these courses is not adopted, it may not be possible, after a certain date, to secure copies.

THE PRESIDENT AND THE PRESS.

THE address which was delivered by the President of the Institution of Electrical Engineers at the annual meeting of the Manchester Local Section contained a number of interesting features; we reproduce it *in extenso* from the *Journal* elsewhere in this issue. In the main it follows on the lines of Mr. Wordingham's inaugural address, in which he outlined a programme of reforms that would tax the energies of an archangel to carry through in the short duration of a single session; it is not to be wondered at, therefore, that, in spite of the pressure of his official duties as Director of Electrical Engineering to the Admiralty, he felt compelled to accept re-nomination for a second year of office as President, although he holds the view which we also have put forward—namely, that the practice which has grown up of retaining the President in office for two years is not in the best interests of the Institution. It is noteworthy that the one-year rule was first broken in favour of Dr. Ferranti for the same reason—to enable him to carry out a programme of progress and reform; unfortunately, the seed then sown fell among thorns, and though it sprang up and bore fruit, it failed to survive the chill blasts of opposition and inertia with which it had to contend. As we then pointed out, while Dr. Ferranti showed the way to the promised land, "great changes must be brought about in social, economic, and legislative conditions before the dream can be accomplished to the full. Intensive agriculture, the redistribution of labour, and the conversion of the local authorities from petty parochial views to recognition of the true interests of the nation, are indispensable accompaniments of the progress called for in technology; and in this ancient country vested interests are certain to be met at every turn, while the Socialistic tendencies of the times, if they go unchecked, may strangle individualism, and therefore progress at its source."* We may fairly claim that practically all of these conditions have been fulfilled, though it never entered our thoughts that the necessary changes would be accomplished by the medium of a world-wide war, which has done in four years what might have taken 40 years of peace. Thus the ground is prepared for a new harvest with vastly more favourable prospects of an ample yield, and we cordially welcome Mr. Wordingham's decision to "carry on" for another year, sincerely hoping that, as he deserves success, so he will command it.

Although the present President was openly opposed to the "Broader Policy" initiated by Dr. Ferranti, and embodied his objections to it in an article in our pages adversely criticising our attitude towards the Council of the Institution,† there are so many respects in which his programme parallels that of 1910 that, after all, we think the divergence is more apparent than real. Most of these points were brought out in Mr. Wordingham's inaugural address;

* ELECTRICAL REVIEW, November 18th, 1910, page 810.

† *Ibid*, May 29th, 1914, page 896.

others are added in the Manchester address, upon which we may briefly comment.

We are pleased to see that the policy of developing and encouraging the Local Sections of the Institution which has prevailed in recent years is vigorously supported by the President, who says :—"There are not really any Sections or Local Sections of the Institution. There is the Institution, one and undivided." Now, years ago, we cherished the same view, and in that light we reported the proceedings at the Provincial centres thus, for example : "Paper read before the INSTITUTION OF ELECTRICAL ENGINEERS, at Manchester" ; but it came to our knowledge that this style was distasteful to the authorities, and consequently we reverted to the use of the term "Local Section." Nevertheless, we always felt that the practice was, in a measure, derogatory to the dignity and unjust to the importance of some, at least, of the branches of the Institution, whose work was in no way inferior to that of the London members who rejoiced in the title of "The Institution," and we cordially welcome the President's tribute to the merits of the offshoots of the central body, and the foreshadowed change of title.

Another pregnant phrase in the address, which goes far to justify our contentions with regard to the proper functions of the Institution, is the President's declaration that : "*I do not think there is any matter affecting the electrical industry which is not the business of the Institution.*" There is the whole thing in a nutshell. We cannot too strongly emphasise the point, which is precisely that which we have tried to drive home for so many years. We should like to see that sentence in letters of gold adorning the marble halls of the Institution on the Embankment. Further comment is needless—it speaks for itself.

With regard to the formation of an association for central-station staffs—evidently the "Association of British Electrical Engineers (Electricity Supply Branch)," the proposed formation of which was announced and commented on in our issue of April 5th—the scheme outlined by Mr. Wordingham is interesting, and is capable of wide development ; it will be noticed that it is so devised as to link the Association closely to the I.E.E. as the parent body, whilst providing for the admission of non-members of the I.E.E. In the meantime, the Electrical Power Engineers' Association is making rapid progress, and the future relations between these two organisations will provide a very knotty problem for the industry to solve. It would be most unfortunate if they were to exist in rivalry, both covering much the same ground, with the consequent waste of effort and loss of efficiency and influence, and we trust that some *via media* will be found to ensure their co-operation or amalgamation. However, that question will undoubtedly receive attention at the forthcoming meetings mentioned by the President.

Space limitations forbid us to do more than heartily endorse the other proposals contained in the address, some of which, such as the popular and technical lectures, are old friends but have not yet got beyond the proposal stage ; we must, however, add a comment on the concluding paragraph of the report in the *Journal*—namely, that in which Mr. Wordingham, as in his inaugural address, severely deprecates the attitude towards the Institution of "at all events, one section of the electrical Press," while he regards another section as being "to a very large extent lukewarm about the Institution."

The President further remarks that if the Institution happens to do something which a particular section of the Press advocates, then its having done so is practically ignored.

Now, we freely admit that in past years we have felt it incumbent upon us, as sincere well-wishers of the Institution, and with the interests of the industry at heart, to criticise the policy of the Institution Council ruthlessly and persistently, and we adhere to every word that we have written in this vein. But no one who reads our pages could possibly regard us as "lukewarm" towards the Institution ; and whenever the Council has made a step in any direction that we have recommended, we have been scrupulously careful to record the fact and to commend the action. Our record is open to the reader—and we are glad to add that many times in recent years we have had the pleasure of congratulating the Council upon the adoption of new methods and the development of new ideas, in terms which admitted of no misunderstanding, and which were never insincere.

We feel convinced, therefore, that Mr. Wordingham's remarks were not directed against this journal. Yet he suggests that "the Institution cannot get properly treated in the technical Press," a wholesale indictment against which we must emphatically protest. Our conscience is clear, and we confidently appeal to the judgment of our readers.

As for the proposal to develop the *Journal* of the I.E.E., and "create a Press for itself"—well, we agree that the *Journal*, though already greatly improved, offers abundant scope for further improvement ; but the Institution would be well advised to abandon the idea of creating a Press for itself. "If a man bear witness of himself, his witness is vain"—just criticism is exclusively the function of the impartial and independent outsider.

The Enemy in Trade.

If it were possible to take the anti-German temperature of the British race, we should find it subject to violent fluctuations. It rises several degrees after the enemy has displayed his devilish ingenuity in the form of some new and almost unthinkable atrocity. It is substantially up again since the deliberate bombing of our hospitals in France. If Prussianism paid any regard to the future of German trade relations with its present foes it would, one would suppose, see that every new piece of bombing or submarine barbarism aims a new blow at its own trade, for it settles more definitely than anything else the determination of millions of people in the Allied nations to refuse to re-open commercial relations. But whatever the effect of these horrible outrages upon the Allied mind—and it is an effect to which statesmen will hardly be blind—there are the facts of pre-war days, which have been proved beyond dispute, bearing upon Germany's commercial and industrial penetrative policy. In the course of four years of investigation of such matters, investigations carried out with calmness and dispassionately, unswayed by the fluctuating sentiment to which we have alluded, many practices have been laid bare to legislators and to the trading community which call for a policy of strong determination in the interests of Allied industrial and commercial security. It will be recalled that much criticism was levelled at the head of the Government, because it did not always take immediate action concerning particular interests along the lines advocated by critics. Little by little there was a tightening of the official grip, and one by one enemy concerns were dealt with. The story of what has been done is told in the report of the Committee appointed to advise the Board of Trade on matters arising under the Trading with the Enemy Amendment Act of 1916, of which we give a full abstract on another page, and which we recommend our readers everywhere to study closely. We need not cover the same ground in these comments, but we believe that the electrical industry will agree that if we are going to deal fully with German trade penetration the operations of recently naturalised Germans must not be permitted to escape our attention. We may be better able to tell "who's who" under the Business Names Registration Act, but we ought more jealously to guard against the adoption of the prefix "British" before the name of any concern that decides to open operations here, on however small a scale. In our abstract we quote an example of the methods adopted by Germans to gain control of a certain British electrical concern "by sterilising its power of competition" in our Colonies, and utilising its factory at Home to undercut British manufacturers in the same line of business. The Committee appears to have come up against certain matters which call for investigation, but did not fall within the compass of its operations. We understand that it has completed its labours, but we are sure that so practical and "live" a business man as Sir Albert Stanley will see fit to base a strong preventive policy upon the information that it has accumulated —and perhaps appoint another Committee.

CLINKER DAMS.

By C. M. BENNETT, Wood Lane Works.

The question of suitable clinker dams, or adjustable dumping bars, for mechanical chain-grate stokers is undoubtedly one of great importance, especially at the present time, and has been the subject of careful study from the earliest use of the chain-grate.

Fig. 1 shows a water-cooled dumping-bar which is of interest, as the illustration came to the writer from the late Sir Frederick Bramwell, and was used on the original Jukes chain-grate about 1853.

However, these fixed dumping-bars are, as Mr. G. W. Partridge points out in the article printed in the Electrical Review of April 26th, not suitable for varying qualities of coal, and therefore some adjustable type of bar is essential.

In 1902 a patent was granted to H. W. Miller and C. M. Bennett (see British Patent No. 10,339/02) for an adjustable bar in connection with the close-link stoker, the nose of the bar resting on the surface of the grate, a condition which was not possible on the ordinary type of chain-grate link, owing to the projections formed by the opening of the links in turning over the rear drum of the grate.

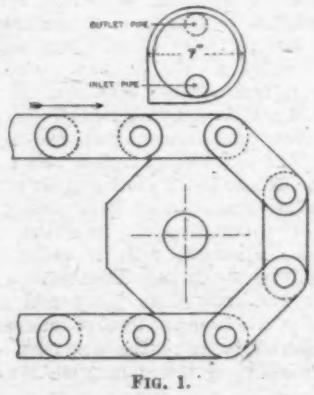


Fig. 1.

The advent of the close-link type of chain-grate described in the British patent above cited, made the problem of the dumping-bar a much easier one, as it became no longer necessary to support the bar off the surface of the grate.

The position of the rear end of the stoker, and, consequently, the position of the dumping-bar in the furnace, is also one requiring consideration and attention.

It is desirable slightly to lengthen the stoker so as to carry the rear drum, together with all the dumping gear, through what may be called the dumping arch, and into a separate chamber formed behind the back wall of the furnace proper.

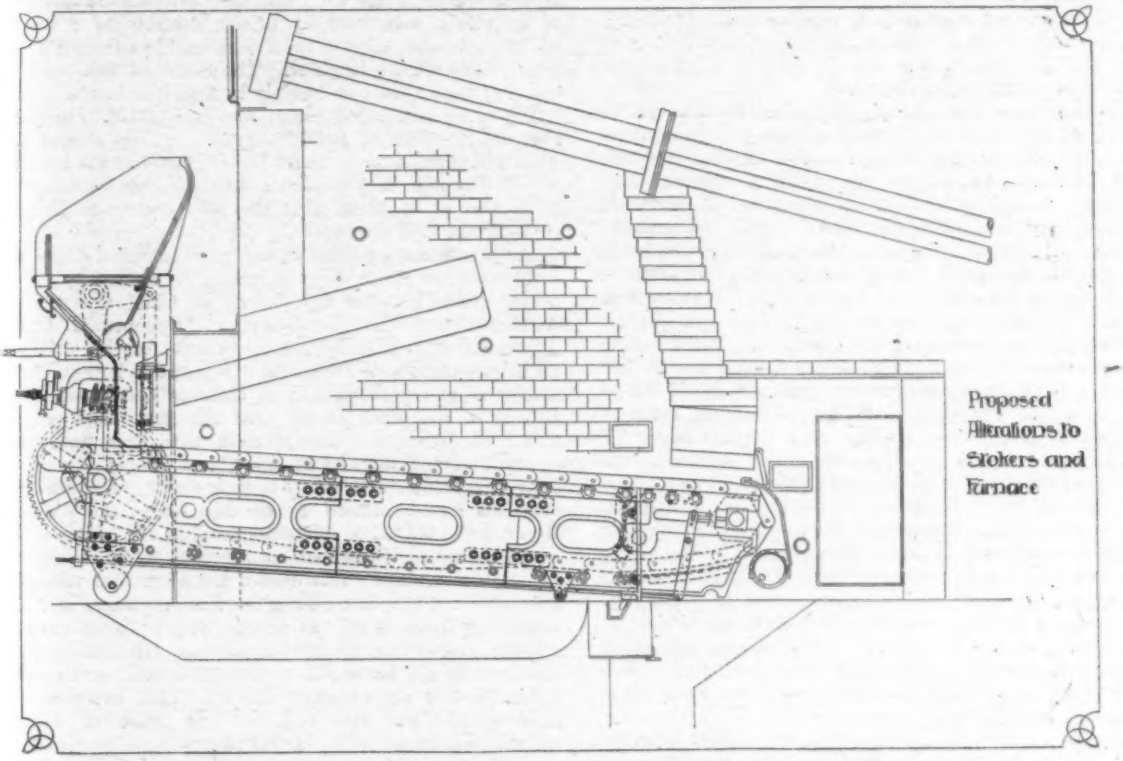


Fig. 2.—Arrangement of Chain-grate Stoker and Dumping Bar.

This arrangement is shown in fig. 2, and it will be seen that the back drum of the stoker and the dumping bar are placed in a chamber which is comparatively cool compared with the furnace; in fact, by opening the inspection door, any dumping bar or clinker trouble can be at once investigated, even when the boiler is under load.

Under these conditions the dumping bars and rear ends of the chain-grate stokers have a much better chance of long performance without renewals than they have when their position is at the front side of the furnace wall.

The "doctor door," or adjustable gate, shown in the article above mentioned, is undoubtedly a great step in the right direction, and all such useful and important devices will come into general use as soon as more attention is given to boiler-house equipment and operation.

It seems, however, that the present arrangement for admitting coal to the furnace by being carried under the furnace doors by the moving chain of the grate is not an ideal one, and could be vastly improved, leaving the furnace doors free for hand-firing in the event of grate breakdown, and allowing for free inspection of the fires through sight holes in the furnace doors, as well as for the admission of air, if necessary, through "hit" and "miss" openings (the air being heated by passing through traps in the door casings). Inspection of fires from the front along the length of the chain-grate is now impossible, because of the "apron-plate" retaining the coal; yet this view of the condition of the bed of burning fuel is a most important one.

The fires of the inner furnaces on many installations cannot be properly seen—in fact, not seen at all, their condition being judged by the outer furnace fires, which can be seen through inspection windows in the side walls.

A BRITISH IDEAL FOR MANUFACTURERS.

By "IMPERIAL."

Some years ago, sitting in the Octagon Lounge of the Midland, at Manchester, were several groups of electrical engineers, one of them discussing the rival claims of Berlin and Hamburg to be considered the centre of German trade. At last, rising to go home, one of the group said: "Why worry with Berlin or Hamburg? *This* is the commercial capital of Germany"—and, looking round at the galaxy of representatives of Siemens, the A.E.G., and many another of the old firms we knew so well, the hyperbole seemed justified. We took our foreign rivals to our hearts, and not only gave them our own orders, but allowed them to regulate our business in other parts of the world.

But this theme, since the war began, has been laboured to death; we cry "Peccavi," and reorganise and reconstruct so that it never can happen again—and all the while with our left hand we do what we swear, with our right extended to Heaven, we abjure for ever. It is true that the parasitic band of irresponsible agents who overran the country factoring German apparatus are inactive — probably munitioneering—and it is true that the German interests are eliminated from the large manufacturers. We may hope that they will never return—we may be sure that in their old form they are dead for a while at least. But when the reconstruction of the world commences, shall we be any more free from futile, unnecessary burdens? Shall we be able to say of our goods:—"This is English, made in England by Englishmen trading with English money"? And if we can say that, shall we be able to command the markets of the world as we command the seven seas?

Perhaps we may; it is one of the rewards we hope to snatch from chaos. But it is all too easy for the reward to be thrown away, and for the same haphazard indeterminate scheme of things to be revived. We most of us know what is wanted, and we each have a different way of getting it. One cries aloud that in the face of Government-subsidised competition we are helpless: let the British Government give grants to every manufacturer; then perhaps we shall get to work as quickly and effectively as a certain giant concern in Huddersfield.

Another calls for protective tariffs, and a third for State control. All this is useless paltering—the mere payment of taxes to receive a part back as our own profits. Besides, did ever a firm admit that the organisation of a Government department was ideal? No; the help that would be obtained would be as useful as when we now complain that aliens crowd us out of our trains. We are told that the accommodation will be limited, that 20 per cent. more will be charged for our season tickets, and then we can fight on the same level as the aliens.

There is no help for it. We must still earn our bread in the sweat of our brows and in the sorrow of our hearts—and we must, above all, work out our own salvation. Everyone knows really what has to be done, and that the root of it is co-operation; co-operation in every direction—between competing firms, between firms and employés, and between employés themselves. Some steps have been taken; we have the B.E.A.M.A. Within that body are conferences on many things—our ratings and our prices are standardised, we each know the others' designs; and in two of the largest firms, the London export manager is the European representative of what used to be the American parent company.

It was with pleasure that we read recently Mr. Annan Bryce's statement that the British Westinghouse Co. had got rid of the American controlling interest, and intended in future to carry out its own research and make its own designs instead of copying the American. But yet the American company will probably, somehow, get to know our standards; the standards not only of the British Westinghouse, but of every manufacturer.

How can we hope to compete if we, with maudlin sentimentality, give our foreign competitors our vital secrets?

We are improving, it is true, on the days when a Meter Conference had a Committee of three—one representing a German, one an American, and one a British firm. What glorious internationalism! But it represents a spirit that still exists. We cannot, apparently, realise that between nation and nation there must be rivalry; friendly or not, it is still rivalry. There is talk of a League of Nations, to guarantee the peace of the world, and the freedom of the seas to all commerce. The only possible living, lasting League of Nations is the British Empire, and that controls the seas and keeps them open to all just, upright, and free men. Let us incorporate that principle in our own affairs; let us have a truly British association open only to firms of pure blood. In the B.E.A.M.A. there are still firms with enemy-born directors. Until recently the British Westinghouse Co. could only say that the majority of its shares were held by British subjects by a verbal quibble; because most of them were held by a limited company registered in England. The shares of this holding company were almost exclusively in American hands.

It seems possible that recent movements tend to increase the predominance of British capital. Amalgamations are afoot which make for powerful British firms, and it is to be hoped they will keep free from undesirable entanglements. It is also to be hoped that they will encourage British engineers in their own works.

Many rumours are afloat of unions of technical engineers—and this new spirit of co-operation is marked by internecine strife between the Society of Chief Commercial Assistants and the Association of Commercial Chief Assistants, or some such bodies. In spite of the strife, it all helps—these bodies may bring pressure to bear on their employers, and, perhaps, that is their only way to success. But is it too much to ask that the new, more or less unfledged directorates should show that they have the interests of the industry at heart, and temper justice to their shareholders with mercy to their staff? The working man has forced himself to be considered; the Whitley Report urges tribunals combining capital and labour—but where, as an egotistical engineer remarked, is the representative of brains? Intelligence has no market value, or we should not find, as we do in one firm, engineers with 10 years' experience, as well as a university training, earning £200 a year, or less, while younger men, with little education, earn on the bench £6, or even £8 a week, making the apparatus that the engineer designs. That any management should see this, and find its sense of equity undisturbed, shows little sign of reformation, particularly as the total paid by many firms to their technical staffs in the way of a war bonus is less than 2½ per cent.

The need is here, and the opportunity is here. Is there no hope for a British movement for the commercial advancement of the country and the individual? The individual recognises that his advancement rests on the success of his company—the commercial future of the country rests on the joint success of its industrial undertakings. Isolated prosperity at the expense of one's immediate neighbours cannot be permanent, and so, since we have during the war at least learned that we are a nation with a national life, let us unite in the national interest. We may, some day, grow old enough to take a wider and international view, but it is first necessary to have a sound basis at home. National unity is the primary essential—unity with one another, and against outsiders. It was once suggested that B.E.A.M.A. stood for British Electrical and Alien Manufacturers' Association, and the stigma was warranted while firms with foreign capital and no works at all belonged to it. There is one ideal it could achieve. It could have an exclusive membership of manufacturing and contracting firms ("contracting" in its widest sense—not merely to indicate wiremen), with a predominance of British capital with purely British directorates who favour British engineers and treat them justly and generously. Such an Association, free from any taint of internationalism, would be an Imperial factor of the first rank. It would command the admiration of this country and the respect of the world.

Roll of Honour.—We have received a pamphlet of 40 pages, containing names and other particulars of the staffs and employés of Messrs. S. Pearson & Son, Ltd., the Mexican Eagle Oil Co., Ltd., and other associated companies, who are serving with H.M. Forces.

LUBRICATION AND ELECTRICAL PLANT.

By G. BASIL BARHAM.

Before the war an electrical engineer could obtain a dozen different varieties of oil to suit each one of his requirements. Were none of these exactly what he wanted, or fancied he wanted, the oil refiner was only too pleased to submit specially blended samples of animal, vegetable, mineral, or composite oils until the test room shelves looked like those of a hospital dispensary, and no one on the staff needed to buy any oil for bicycle, boots, or bitumen-removing for months. The present situation, however, is summed up in the following conversation, reported from a North Country station :—

"Please, sir, the oil's come!"

"Has it, by Jove! Keep about half for the turbine and save a drop for the oil switches; fill the air raid lamps and go up to Dr. Jones' and try and get a Priority Milk Card; if we could get even a quart, we'd try making some margarine!"

Before the war, no electrical engineer would choose an oil solely on account of its lasting properties. They were at that time a secondary consideration; the lubricating qualities were the essential feature, and oil was in itself so cheap that it could be, and was, used in quantities that would seem lavish to-day. It was held that the first essential of a lubricant was that it should possess a low and constant coefficient of friction, so that as little heat as possible would be generated by the moving parts. Although well aware of the fact that were a film of oil maintained between the parts its function would be fulfilled, there were many who apparently tried to float the parts in oil, and it may be asserted that, in view of what can be done at the present time when oil is scarce, in practically every case we had a marked tendency to over-oil.

This was, no doubt, due primarily to the knowledge, gained sometimes from painful experience, that some oils had a tendency to squeeze away and leave parts starved; others contained "filling" which tended to clog and gum, with the result that before long the moving surfaces would start cutting, although they appeared perfectly lubricated. It must be whispered, also, that refiners were vitally interested in the sale of oils; they wanted it known that the oils they supplied would do their work well, and that it was false economy to spare the oil and spoil the crosshead; further, they had really very little to say in favour of oil filters, or the use of cheaper oils, or economy in oil use, or anything else that did not deal with the delivery of so many more barrels per week.

In spite of the lavish use of lubricants, it is a fact that in pre-war days quite 80 per cent. of engine troubles were due to imperfect or improper lubrication. In this, one is not taking into account boiler and air-pump troubles caused through excessive lubrication of the cylinders of vertical condensing engines and piston valves, or through the use of solid soap lubricants containing an excess of caustic soda, which during use is converted into carbonate of soda, a fairly keen cutting material.

At the present time the scarcity of high-grade lubricants necessitates a more lavish use of the human element, and parts and bearings have to be watched that in other days were provided with ample oil and left to themselves. Instead of the many carefully-blended varieties of oil previously available—many of which unkind critics asserted came out of the same vat—the electrical engineer has to be content with plain oil, and he is eyed askance if he shows any disposition to inquire into its constitution and components. A good deal of white lead and also of sulphur is used to-day in stations where such substances were never used, for a similar purpose, before the war, and many an engineer keeps an oil-can ready charged with oil-white lead or oil-sulphur mixture, ready to squirt a quarter of a pint into some part that is showing a disposition to throw off blue smoke, just as his father and grandfather did before him.

Reference has been made to the use of solid and semi-solid lubricants, and where these are perfectly free from the objectionable caustic soda, and are prepared from high-quality materials, they are satisfactory in use. One of their chief advantages is that they will adhere to metal surfaces with tenacity, and if the soap content is not high they can be used on all metals. If there is an undue percentage of soap the oil content is readily squeezed away, and the clogging of the lubricant actually creates friction instead of reducing it. The solid oils are far more economical in use than is generally supposed, and where an engineer can obtain them he should make a fairly large use of such as he knows to be reliable.

As a matter of fact, a great deal of the oil obtainable to-day, unless absolutely fancy prices are paid, is far from reliable, and it will pay the engineer in many cases to break down semi-solid paraffin or vaseline into it, or to add such proportions as he thinks fit of good rape, or castor oil, or tallow, to improve its body and enhance its lubricating qualities.

Contrary to the usual opinion, the frictional resistance of oil is one of its least important properties from a purchaser's point of view. The points of importance are the viscosity of the oil, its cold pouring temperature, and its emulsibility with water. Those which matter comparatively little are the frictional resistance, gravity, and the fire and flash points. The first of these is very much the same with all oils, so from that point of view a dear oil is no better than one which can be obtained at, perhaps, a tithe of the price; and it may be mentioned, also, that high viscosity produces a high degree of friction. This should be borne in mind, by the way, when adding "body" in the shape of some thick, viscid oil to a lubricant of apparently poor quality.

Many electrical engineers are aware that properly refined oils are clear and pale. Even under existing circumstances, when one is almost glad to get any oil at all, "red" oils should be avoided as far as possible, as the element of redness shows that they are not true high-grade oils, and that they contain certain ingredients which have not been properly removed. They are, however, fairly suitable for use where the formation of emulsions does not matter.

Before the war many electrical engineers had a prejudice against mixing good oils of fairly similar qualities. It may be said at once that this does no harm, and only in very rare cases has such mixture resulted in seriously impoverishing or altering any of the properties of the oils. As a matter of fact, the lubricating and physical properties of mixed oils are, for all practical purposes, a mean of those of the constituent lubricants. If, for example, we took a gallon of oil which had 300 seconds viscosity and a flash point of 400° and mixed it with three gallons of oil of 150 seconds viscosity and a 370° flash point, the result would be an oil with a viscosity of 187·5 and a flash point of 377·5°.

The present shortage has brought the subject of filtering and "reviving" oils into prominence. It has been recommended in some quarters that all "old oil," "worn-out oil," "lifeless oil," and so on, should be thrown away and replaced at stated intervals with "fresh" new oil. The use of oil filters was strongly opposed in certain quarters, and from what was said many electrical engineers gained some hazy impression that it was bad practice to use oil over again. There is little or no evidence to show that a good oil wears out or loses any essential lubricating properties under ordinary circumstances. The influence of heat will, of course, drive off a percentage of any original oil, and so cause it to become heavier, but in no way is this detrimental to the oil, which simply has its viscosity raised and its bulk reduced.

The principal trouble with low-grade oils in the past has been that they frequently contain ingredients which in time produce acids or form bad emulsions with water. Any leakage of thin into thicker oils will reduce their viscosity and, to that extent, impoverish them.

Tests which have been carried out on used oils show that the old impression was fallacious, and there would seem to be no reason why electrical engineers should not filter oil over and over again. Good oils used in forced-feed lubrication in internal-combustion engine work—a fairly severe test—for 1,000 hours showed some trace of oxidation; but even then the lubricating properties were neither impaired nor changed to any material extent. There was a slight

increase in the formation of resins and of organic acids; and it must be mentioned here that after long use these ingredients might form a percentage sufficient to impair the lubricating properties of the oil if no attention were paid to the matter. Electrical engineers will be interested to hear, however, that not only can these ingredients be removed without difficulty by filtering the oil through animal charcoal, but that it is the practice in the United States Navy to use oil continuously, filtering it periodically, and adding, when necessary, fresh oil to reduce viscosity. It may be mentioned, though the point is not material, that the cold pouring point of the oil referred to above rose to 20° F., from 10° after the 1,000 hours' test.

A few tests of a simple, yet reliable, character, can be made by the electrical engineer which will be of assistance when rejecting unsuitable oils, or when blending some good oil with a percentage of inferior oil in the station, in order to get sufficient bulk to "carry on." These tests are, of course, only crude methods not comparable with tests carried out in a laboratory, but they are in common use amongst trans-Atlantic naval engineers, amongst whom, by the way, it is known to be a fact that any vessel, battleship or destroyer, could, by choosing two oils and blending them herself, lubricate properly everything on board needing lubrication. These tests are as follows:—

Colour.—A good oil, before use, will appear of a pale yellow colour, and will not separate into layers of different shades, or deposit sediment after being allowed to stand for a few days. It will not rust or corrode in any way any pieces of ordinary polished tool steel suspended in it.

Emulsion.—When mixed with warm water and shaken in a bottle the oil will soon separate entirely from the water, and show no soapy emulsion. In regard to this it must be mentioned that the test does not apply to marine engine oil nor to black cylinder stock oils which are blended, for obvious reasons, to produce this very emulsion.

Acidity.—Tests with blue litmus paper will show whether any acid is present. The presence of acid is detrimental to machinery of every kind.

Wax Content.—At ordinary temperatures it is a difficult matter to decide whether wax, either in the form of solid paraffin or some other substance, is or is not present. The readiest test is to cool the oil with ice, when the wax will have a tendency to separate out, and so cause the oil to appear cloudy.

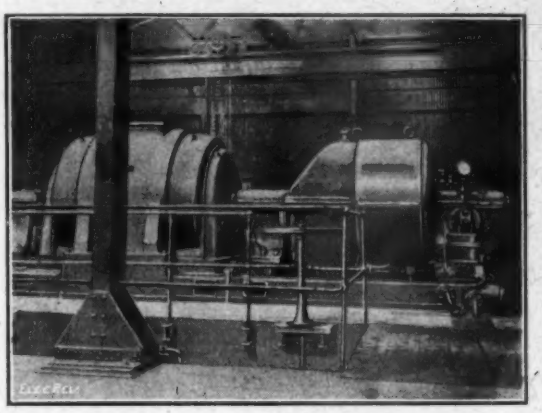
The conclusions arrived at are that for ordinary central station work almost any fair-grade oil will prove suitable for use. Some have high and some low viscosities, the cold-pouring temperature with some is higher than with others; the flash and fire points and the gravities may vary considerably. But so far as ordinary general lubrication is concerned, the difference between any of them is of little importance, and all good oils will prove good lubricants if any objectionable content is removed by filtering. Filtered oil is as good as any other oil; and if one oil is found to be a better lubricant than another, it will generally be found that the results have depended entirely on local conditions. There has been a good deal too much theory and far too little practical test in connection with this matter of lubricating oils, and those electrical engineers who have never felt quite sure of their ground in the matter may take courage from the fact that in more than one instance a warship has managed to get ordinary fuel oil mixed with ordinary machine oil, and has gone on using it as a lubricant for every purpose, and, what is more, has obtained satisfactory results!

A Norwegian Electric Motor Bicycle.—Some trials have lately been held in Christiania with an electric motor bicycle devised and constructed by Mr. Joannes Bjorge, of that city. According to the brief particulars to hand, the battery, which is carried between the two wheels, is capable of running the machine a distance of about 45 miles on one charge. The motor, from which the rear wheel is driven, is located on the lower part of the frame just behind the battery. The controller and other electrical apparatus are contained in a box carried by the top bar of the frame. It is stated that the weight comes out at about the same as that of a petrol motor bicycle, and that in the trials a maximum speed of 40 miles per hour was attained on the level.

EXTENSIONS AT CHESTERFIELD ELECTRICITY WORKS.

CHESTERFIELD is one of the towns which have had to meet great demands for power since the outbreak of war. The old plant has been considerably overloaded for some time, and consequently the need for the new extension which has just been added was great.

This consists of a new power house containing a Westinghouse-Rateau high-pressure impulse type turbine, coupled to a 2,000-KW. three-phase, 6,600-volt, 50-period alternator with exciter. The condenser is of the Westinghouse-Leblanc multi-jet hung type, with centrifugal water extractor pump and rotary air pump, driven by a 90-H.P. D.C. motor. The air for cooling the alternator is passed through a motor-driven Heenan & Froude wet-air filter.

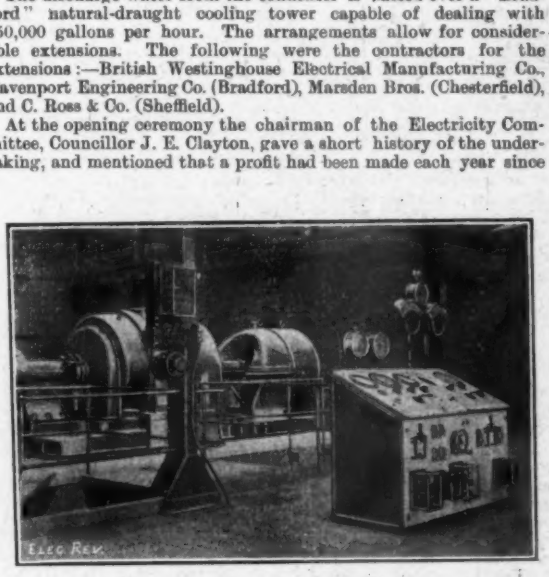


WESTINGHOUSE 2,000-KW. TURBO-GENERATOR.

The switchboard gallery contains a switchboard of the desk remote control pattern in white marble; a Westinghouse voltage regulator is also provided.

The discharge water from the condenser is passed over a "Bradford" natural-draught cooling tower capable of dealing with 150,000 gallons per hour. The arrangements allow for considerable extensions. The following were the contractors for the extensions:—British Westinghouse Electrical Manufacturing Co., Davenport Engineering Co. (Bradford), Marsden Bros. (Chesterfield), and C. Ross & Co. (Sheffield).

At the opening ceremony the chairman of the Electricity Committee, Councillor J. E. Clayton, gave a short history of the undertaking, and mentioned that a profit had been made each year since



REMOTE-CONTROL SWITCHBOARD.

the inception of the undertaking. The vice-chairman, Councillor G. Clark, spoke of the benefit that the extension would prove to the new industries that were being attracted to the town owing to the adequate supply of cheap electric power. The consulting engineer and manager, Mr. R. L. Acland, M.I.E.E., spoke in defence of the linking-up of moderate-sized stations as against the super-station idea. The transmission losses in conveying large amounts of power over long distances, he said, would result in a higher cost per unit sold than would be recorded at a local power station in an industrial area favourably situated as regarded coal and water. He mentioned that Chesterfield had been linked up with a large waste-heat power station for over two years, to their mutual advantage. He acknowledged the services rendered by Mr. Butterfield (who was responsible for the drawings and had acted as clerk of works) and by his chief assistant, Mr. W. A. Toppin.

The outstanding features of the Chesterfield undertaking are its overhead high-tension transmission, low-tension overhead alu-

minium conductors, a sub-station giving a steady lighting supply from a traction network, a 500-KW. rotary convertor capable of working at either 50 or 30 cycles, and the use of coke dust and low-grade fuels in the boiler house. Mr. R. L. Acland has been responsible for the undertaking from its commencement, and has shown himself to be an enterprising and energetic engineer.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Industrial Combination.

Industrial combination, which is occupying the minds of manufacturers so much at the present time, is by no means a new doctrine, as so many superficial thinkers seem to imagine. The principle is as old as the hills, and the spirit of all past economic history calls loudly to manufacturers to combine and specialise more in their undertakings, in order to increase the world's productivity.

The only difference in the present movement in industry is that the greatest war the world has ever seen has forced on us the necessity to accelerate the progress of industrial combination to a speed hitherto unattained. The old belief in the supreme value of competition being the greatest incentive to cheap manufacture may have been right in days gone by when international competition was not so strong, but whilst admitting the value of healthy competition, we must not become obsessed with the notion and look upon it as a fetish for our belief, otherwise our efforts remain too parochial in character, and we lose that wide vision so necessary for the future of British trade.

There is such a thing as unhealthy competition, and when we view the sorry spectacle of a score or more of firms, each making, among other things, a certain article, and each competing one with another for a portion of a total yearly trade in the product which may not be more than a few thousand pounds in value, how is it possible to argue that it has the tendency to cheapen manufacture? Its effect is just the reverse.

If we are again to attain the proud position our industry once occupied, we have got to adopt any and every means that will stimulate our factories to their greatest productive capacity. Syndication or co-ordination of effort between firms in the same trade will prove to be the greatest of all influences that will bring about the desired end. The operations of individual firms in each industry should be so arranged that the whole combine would act as one body. This would secure the interests of individual manufacturers, and allow them to devote all their energies and all their initiative to that one great necessity—PRODUCTION—instead of having to spend half their time in fighting local competition, and for ever struggling among themselves for a scrappy share of the existing trade in almost every line produced.

One is reminded of the old phrase, "A house divided against itself cannot stand"; and surely this is the position of a great many trades in Great Britain to-day, and most certainly they will never withstand the terrific "offensive" we are to expect from international competition in the future if we do not combine to present a bold and united front to other nations when struggling again for the trade supremacy of the world.

Howard F. Smith.

Birmingham, *May 23rd*, 1918.

A Question of Competition.

I am taking the liberty of bringing to your notice, and if you will permit the hospitality of your valuable columns, that of your readers, to a matter concerning electrical contractors.

During the last 10 years there have sprung into being districts known as Outer London, where Parliamentary powers for the supply of electricity to these districts have been granted to private companies, who not only have the power to supply consumers with the current, but have the right of wiring properties, supplying fittings, heating and cooking apparatus, and everything appertaining to an electrical contractor's business.

This subject, so well known to us where vested in a municipal undertaking, is quite different when given to a private company, and is most unfair competition as between supply authority and contractor. One offending company are all out to cut the throat of the contractors. We have lately experienced some of their methods, and give two instances of the power given to these people.

1. We estimated for an installation at an aircraft factory in competition with them; we secured the contract by £5. Their representative called on our client and made unsatisfactory remarks about us. The work was completed, and they refused to supply a meter without a priority certificate, although no mention of this was in their own specification. We found a suitable meter already on the premises, and our clients were already paying the rent of it, but not using it; we asked for this to be connected to the new mains, which was also refused, and until our client threatened to bring the matter before the Ministry of Munitions, they did nothing, thereby holding up the manufacture of aeroplanes for nearly a week. They then connected up the existing meter, which should, and would, have been done at once, had they carried out the work.

2. We met by appointment at a house, and secured the order for work to be done at once; upon sending, we were informed that the work was going to be done "direct." This is one of many instances where the company claim the right to do all the electrical work there is to do, and actually inform consumers that if they give the work to contractors, they must come to them, so the consumer might just as well come direct.

In conclusion, we are members of the Electrical Contractors' Association, who have had the matter placed before them, and reply that they are aware of the unfair competition carried on by the company, and have taken it up with them more than once. The Association regret, however, that the supply authority being a company, there is no legal means to restrain them from retail trading.

In the meantime, the company continue weekly to advertise in your columns for electricians for "war" and "maintenance" work, more the latter than the former.

Is there nothing that can be done to stop this unfair competition?

Watson, Marsh & Co. (Brondesbury), Ltd.
M. COHEN, *Director.*

London, N.W., *May 16th*, 1918.

Resistance-Temperature Coefficient of Copper.

Referring to the article in the current issue of the ELECTRICAL REVIEW, page 486, column 2, there is a misprint in relation to temperature—viz., 10° C. (150° F.), which should be 10° C. (50° F.).

H. Savage.

London, S.E., *May 27th*, 1918.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

THE PRESIDENT (Mr. C. H. WORDINGHAM) visited the Manchester Local Section on Tuesday, April 23rd, 1918. He was received by Mr. C. J. Beaver, Chairman of the Local Section, and the members of the Committee, and attended the annual general meeting of the section. After the conclusion of the business of the annual meeting, the President addressed the members present, and in the course of his remarks said, *inter alia*:—

I have been nominated by the Council as President for a second year. I should like to explain why I took on the very grave responsibility of accepting that nomination. There are two aspects from which the office of President can be regarded. It may be looked upon as a kind of prize open to every member of the Institution, a prize to be awarded to those whom the Institution, for some reason or another, sees fit to honour. If that be the way in which the presidency is to be regarded then I think clearly no individual is justified in accepting office a second year. The other aspect is that it is the highest possible opportunity of serving the Institution, and that is the point of view from which I have looked at the matter. In my inaugural address I ventured to sketch out a number of directions in which I thought the Institution might, with advantage, be developed, and so far as has lain in me I have done my utmost to follow out the programme I laid down; but a year—or more especially a session—is an extremely short period in which to accomplish anything. A good deal of the work of the session, in the way of papers and so on, is settled in the preceding session, and it is impossible to carry through in one session any large measure of what one hopes is improvement or reform. I felt when the Council did me the honour to invite me to accept renomination, that much of the work I had begun—of course, in saying that I fully recognise that the work is really done by the Council, but one has endeavoured to lend one's hand to the development—would to a large extent be wasted if it were dropped at this point. It was because I hoped, by taking office for a second session, I could see some of this work brought to fruition that I accepted the renomination. But I want to make it quite clear that I do not think a President is justified in taking office a second year on personal grounds.

It is of the utmost importance to the Institution that it should extend its influence in every possible way, and the way in which that influence can best be extended is, first of all, by cultivating and developing what we at present call the Local Sections, and by securing in some way or another the interest of every individual member in the work of those Local Sections and of the Institution as a whole. What appeals to me most strongly is that there are not really any Sections or Local Sections of the Institution. There is the Institution, one and undivided. Some members live in London, some live in the provinces, but it surely must be disastrous to the Institution if advantage can only be taken of the ability of those men who happen to live in London. For that reason I think every possible measure should be taken to enable the Local Sections to develop and to allow the Institution to take advantage of the abilities of those members who happen to live out of London.

We must make the Institution, if it is to be useful, as

flexible as possible. We must be on the look-out for important questions affecting the industry, and endeavour to be beforehand in catering for the difficulties which arise. I want particularly to make clear that there are certain matters which the Institution, as an Institution, cannot properly deal with, but I do not think there is any matter affecting the electrical industry which is not the business of the Institution; that is to say, even if we cannot, as an Institution, take action in connection with some matter that arises, it is the business of the Institution to see that proper action is taken, and that, if no body exists which can take that action, such a body is formed.

One matter of extreme importance has arisen during this session. I refer to the need that has become evident for combination among the staffs of central stations. It is quite clear that the Institution as an Institution cannot form an Association, or act as an Association which could look after the interests of the central-station staffs; but the Council, or, rather, I personally, have met a Committee which was formed to found such an Association, and the Council, as a result of that interview, have decided to further in every possible way its formation. The *modus operandi* is that at a very early period there will be called in connection with each Local Section a mass meeting of, not necessarily members of the Institution, but members of the staffs of supply undertakings, to consider the desirability of forming such an Association. Those mass meetings in connection with the Local Sections will be asked to appoint delegates to attend a mass meeting in London, at which I have every confidence this Association will be started. Its object will be to look after the material interests of its members, and it will be proposed that membership of that Association should be based upon membership of the Institution; that is to say, that members of the Association must be corporate members, in one class or another, of the Institution of Electrical Engineers. There will be a further class known as Associate Members, who need not be, and who are not, members of the Institution, but who possess certain qualifications which will be defined. There is another section, the manufacturers' staffs, in regard to whom the Institution has similarly been approached, and I am confident that before long we shall be able to organise a similar Association for the manufacturing staffs.

I want to make it quite clear that these Associations are entirely distinct from the Institution, because the Institution cannot possibly fulfil the requirements that such Associations must fulfil. An Association to be recognised by the Government must have only definite circumscribed aims, and the aims of the Institution are much too catholic and too wide to enable it to act itself as these Associations, but I think by assisting in every way, by countenancing these Associations, by putting the experience of the Institution Council at the service of those forming the Associations in the early stages, the Institution is fulfilling its mission of looking after the industry, and doing it in the most efficient way possible.

I have referred several times to the Local Sections, and I should like to say a little more about them. The Council have set up a special committee to consider in detail how best to extend the activities of the Local Sections. To begin with we hope to call them by a more appropriate name than Local Section. It is to be hoped that powers will be delegated to these Local Sections more especially in regard to carrying out researches in those districts which are peculiarly adapted to the particular research in view. There are districts in the country where facilities exist for production and for testing, which can nowhere else be so satisfactorily found, and the proper way of dealing with these researches seems to be to appoint local sub-committees which will take up and fully develop the matters delegated to them, and report to the main Research Committees in London.

Another very important work that we hope the Local Sections will carry out is that which is already carried out in a large measure in Manchester, viz., the promotion of co-operation among other engineering bodies and branches of engineering bodies. In Birmingham there is a strong feeling in favour of this, and the Council is fostering it in the hope that good results will accrue; similarly in Newcastle, and I have no doubt in all the other centres.

I am keenly interested in the question of proportionate representation on the Council. Under our existing Articles it is impossible to arrange for that, because we have no means of controlling the way in which the election of new candidates is carried out at the ballot, but this year the Council divided up the interests of the Institution into a certain number of heads, and voted for the new nominations separately under each head, so as to secure the desired number of nominations for each interest. The result was that if the Council nominees were in fact elected to the Council, we should have a well-balanced Council, but that scheme breaks down at the ballot because it is not possible to put before the general body of members the same means of subdividing the votes as we adopted on the Council. Further, the Local Sections send their seven Chairmen to the Council, and there is no guarantee that these seven members will not all represent one interest. Of course they never do, but they might. In other words, however careful we may be to maintain the balance among the members of Council elected in the ordinary way, we cannot control in any way the interests which are represented by the Chairmen of the Local Sections.

One word as to the next session. Some things which I have advocated it has not been found possible to realise this year, but I do not see why they should not be next. One thing which I had very much at heart, was an attempt to interest the general public in the work of the Institution by the giving of popular lectures. You are all familiar with the lectures given in London at the Royal Institution about Christmas time. They have been given for many years past; they are a unique affair. I do not think we should have much prospect of success if we attempted to institute lectures of the kind in London, because we should have the competition, so to speak, or, rather, we should be attempting to enter the field so splendidly covered, for many years past, by the Royal Institution. So far as I am aware there is nothing of that sort in this district, and I commend most heartily and earnestly to the Local Section the question of organising next year a series of three or four lectures of the kind by some prominent men who have the gift of giving these popular lectures. I believe that if properly organised these lectures would be extremely popular in the city, and it would certainly be a very excellent way of bringing the Institution before the general public.

Another allied matter is the giving of lectures, as distinct from papers, to members of the Institution on specific branches of work. As I said in my inaugural address, many of us would be extremely glad if we could have presented to us, by an expert on the subject, a *résumé* of some newly developed branch of electrical work—for example, electric furnaces. If we could have a full account of all that has been done in that direction brought before the members of the Institution by somebody who was a past-master in the subject, one of the leaders in that particular branch, it would be of great benefit.

I feel very keenly that the Institution has suffered from the publicity which it has experienced at the hands of, at all events, one section of the electrical Press. For some reason which I cannot fathom, nothing which the Institution does can possibly meet with the approbation of a section of the Press, and everything it does meets with their disapprobation. If the Institution happens to do something which that particular section of the Press advocates, then its having done so is practically ignored. I do not understand the reason. Another section of the electrical Press is to a very large extent lukewarm about the Institution, and seldom refers to it. I believe if the Institution cannot get properly treated in the technical Press it will have no choice but to develop greatly its *Journal* and create a Press for itself. A very great deal might be made of the *Journal*. I should like to see it greatly enlarged, and run very much on the lines of a publication whose name I will not pronounce because it is German, but I will simply call it the E.T.Z. All of us must feel the need for some publication in which we could find everything that really mattered for us to know, without having to dig through the enormous amount of verbiage, repetition, &c. Many members, I am afraid, are in the habit of putting away the *Journal* without opening the covers, but if they knew they were going to find a lot of interesting matter which they ought to know in order to keep up to date, I am inclined to think that the covers would not only be opened, but would be very well thumbed. We have made a very humble attempt at rendering the *Journal* more interesting by adding a few pages which are distinct from the general body of the publication, and members who have opened the covers will have found more there than they expected to interest them. I should like to see that developed materially.

(Other matters touched on by the President were:—The British Engineers' Association; Engineers' Clubs; a Royal Charter, and correspondingly enlarged scope, for the Institution; action by the Council concerning Fuel Oil; the Patents Bill; formation of an Electrical Cooking Association; Research; the Electrical Training Organisation; and the National Electrical Proving House.)—From the *Journal* of the I.E.E

TRADING WITH THE ENEMY.

[Report of the Committee.]

In our last issue we briefly referred to the report of the Committee appointed to advise the Board of Trade on matters arising under the Trading with the Enemy Amendment Act. The report is now on sale (Cd. 9059. 1d.) Since their appointment in February, 1916, the Committee have held 139 sittings, at which persons interested were heard, and 960 separate cases have been dealt with. Cases are still being discovered and brought up for their consideration.

The Committee almost immediately were convinced that, in cases in which businesses formerly carried on mainly for the benefit or under the control of enemy subjects were useful and successful businesses, it was more in the national interest to transform them into British businesses than to wind them up, and accordingly, after consulting the Custodian, they have on many occasions recommended that the enemy subject interests should be vested in him as the custodian for sale. In this way a number of useful businesses are now carried on in British hands, which were formerly largely or wholly in the hands of enemy subjects. The Committee, however, only took this course if it appeared probable that a sale would eventuate, and when it seemed doubtful whether the

enemy subject interest could be sold or not, they recommended a winding up order in the event of no sale being found possible within a reasonable time. When the business did not appear to the Committee to be of sufficient trade importance to make it expedient to vest in the Custodian, so as to avoid a winding up order, they recommended winding up. Some of these businesses have also passed into British hands by sale in the winding up proceedings. The object of the Committee in recommending vesting useful businesses in the Custodian instead of a winding up order resulting in a sale, was to avoid the discredit which would have attached to the businesses if a winding up order had been gazetted.

In dealing with small retail businesses, which was one of the categories of cases which Sir G. Cave included among those in which it would be inexpedient to order a winding up, the Committee have been guided by the police report and the dossier of the owner of the business. If, in a case of this description, a favourable report was made by the police the Committee did not recommend a winding up unless after examination they had reason to think that a winding up was desirable, and the same course was adopted in cases in which enemy subjects had a son or sons in the fighting forces. In a few cases in which new businesses had been introduced into this country in competition with businesses which were formerly the monopoly of enemy countries, and which depended upon the personal supervision of an enemy subject, the Committee recommended exemption in respect of his individual interest, provided that in other respects they were satisfied that the enemy subject's record showed him to be trustworthy.

It will be seen from Schedule "A" attached to this report that in a number of instances the Committee advised that Section 1 of the Act did not apply. Some of these were cases in which one of the partners, who was an enemy subject, was resident in an enemy country at the outbreak of the war. The High Court has decided in Stevenson's case that under these circumstances the partnership was determined. In such cases the Committee have recommended vesting the interest belonging to the enemy subject in the Custodian, and in other cases in which it was not established that the business was mainly carried on for the benefit or under the control of enemy subjects, and which were, therefore, not cases in which a winding up order could be made, the Committee adopted the same course, and recommended that the enemy subject interest should be vested in the Custodian with a power of sale. In many of the cases, therefore, in which the Committee have advised that they were not within Section 1 of the Act the enemy subject interest has in this way been eliminated.

Cases in which enemy subjects have been resident in this country for a long period of years, have married British wives, are the fathers of children who are British born subjects, and whose record was in other respects unimpeachable, have been strongly pressed upon the Committee as cases in which exemption ought to be granted, but the Committee, in view of the mandatory provision of the Act, have not felt justified in recommending exemption on those grounds only, although they have felt sympathy with some of the persons affected. Enemy subjects, for instance, with those ties, who came to England in the seventies and eighties, have had no connection with their country of origin for many years, but have not been naturalised because it did not occur to them that it was required, and whom it has not been thought necessary to intern, the Committee are inclined to think, are as much entitled to consideration as many of those who have come to England, especially of late years, and have become naturalised.

The Committee have a strong suspicion that in many instances British nationality has been adopted purely as an armour of defence, and it is not at all improbable that the adoption of it has been made a condition of financial support. But such businesses are not within the jurisdiction of the Board of Trade either under Section 1 or Section 4. If, however, German trade penetration is to be fully deal with, some of the cases in which it is carried on by recently naturalised Germans would seem to require consideration.

The business of Ettlinger & Co. is mentioned as a case in point.

An important category of businesses in which the Committee have recommended a large number of exemptions are those of persons who may be described as friendly aliens—Czechs, Ottoman subjects who are members of the fraternity of Spanish and Portuguese Jews, Christian Armenians, and Polish Jews.

As regards Hungarians, the Committee were informed by a solicitor, who represented one of the businesses which was being considered, and who had a professional connection with a number of Hungarian businesses, that British businesses in Hungary were not being interfered with, and that a league existed in Hungary with 3,000,000 members pledged not to buy German goods. It was, however, decided by the Board of Trade not to exempt Hungarian subjects on the ground of nationality alone, but it was rarely found necessary to interfere with Hungarian businesses.

A great variety of cases have been considered by the Committee. They have varied in importance from the Siemens business with a capital employed of over £2,000,000, and the Badische Co., Ltd., with an annual sale of £354,000 of dyes, to that of a tailoring business with a profit of £150 a year. The cases included the following:—Cables and wire, 6; electrical, 41; engineering and building, 36; hardware, &c., 17; machinery, 39; metals, 48.

It was not part of the functions of the Committee to inquire into the genesis of the establishment of the extensive and important trade which has been conducted by enemy subjects, mainly German, in this country, and although such an inquiry would have been interesting, the number of cases which it was the duty of the Committee to deal with precluded any consideration of matters which were not strictly relevant to the issues they had to decide. The sources, for instance, from which the financial support was obtained which enabled such an extensive trade to be established and carried on in this country could not be inquired into.

The cases of the German banks operating in London were not dealt with by the Committee, and the businesses which came before them in which German banks were directly interested were few in number.

The variety of trades in which German subjects were engaged was a noticeable feature of the Committee's work extending from the great chemical and electrical combinations to the collection and export of rabbit skins.

Whatever the business was, organisation, adaptability, personal application, and, in case of necessity, ruthless competition, produced successful results, for in few of the numerous cases upon which the Committee advised was the business found to be unprofitable.

In the course of the Committee's inquiries, the necessity of the legislation for the registration of names has been fully demonstrated. Foreign traders have habitually substituted British names for their own for the purpose of misleading their customers into the belief that they were dealing with British principals instead of aliens.

On one day recently four cases of this kind came before the Committee for consideration, and they had lived under these aliases for years.

The free choice of titles which joint stock companies enjoyed also enable foreign traders to conceal their nationality and acquire whatever advantage may accrue to a business appearing to be a British business.

The practice of adopting the word "British," or some other title or name which disguised the fact that the business was German, is now well known. But the extent to which German businesses were conducted through a British staff and by British employés is remarkable. In case after case the Committee found that, although the profits mainly belonged to the German proprietor of the business, it was carried on entirely or almost entirely by a British staff and by British employés. In many of these cases the British managers and employés are now carrying on the businesses on their own account, and the businesses have become British businesses.

The methods by which German influence gained the control which it had obtained in certain of the trades carried on in this country is well illustrated in the following cases:—

"A company was formed in 1897 to work certain important electrical patents taken out by a British subject whose relatives held the chief part of the capital, the remainder being held by neutrals interested in working the patents in France. The same patents were worked in Germany by a powerful combination. When the patents expired in 1904, practically the whole of the capital of the English company passed into the hands of the German company under the stress of the German company's competition, and a territorial agreement was made, under which the British company was restricted from selling outside Great Britain, even in British colonies. The German company, having obtained control of the British company, and sterilised its power of competition out of Great Britain, proceeded to utilise the manufactory of the British company for the purpose of undercutting a very important business of a similar kind carried on by another British company, until it was forced to accept an agreement under which it had to resign its foreign business, though it still held on to its business in the Colonies.

"Another illustration was that of the manufacture of an article which is extensively made use of by the War Office and the Admiralty. Before the company was formed in 1910 it had been manufactured at works in this country, and contracts with the Admiralty had been held for many years. But the manufacturers had to meet the competition of a powerful German combination, with the result that prices were cut, and in 1910 a representative of the combination threatened to undersell them if a combination was not effected. The manufacturers were not financially strong enough to withstand a competition of that kind, and the result was that the company was formed to take over the business, all the shares in the company being held on behalf of the German combination by British trustees. By the contract of transfer the proprietors of the business were to be employed as managing directors, but one of the covenants provided that they should not manufacture for any other persons than the purchasers. Half the product of the article in question manufactured in England before the war was manufactured at these works. The German proprietors exercised no control over the manufacture which was carried on under the name of the proprietors and managed by them as before. No dividends were paid, but profits were used to improve the works to the extent of £10,000. There was, in fact, no outward and visible sign of the German interest in the business, or that it was not a purely British concern."

The Committee found that German producing houses commonly adopted means to avoid the payment of income-tax in this country. An agency or branch was established here, frequently in the form of a limited company with a small capital, to which goods manufactured in Germany were forwarded for sale at prices which were arranged so as not to allow any considerable margin for profit after the payment of the expenses of the agency or branch, the profit being made by the parent house out of the prices at which they were charged to the branch. This practice, no doubt, is not confined to German houses, but the result has been to assist the competition of German manufactures. These agencies or branches have been usually carried on under British names, and frequently by the employment of British salaried agents.

The important cases in which application was made to the Board of Trade under Section 2 of the Act to determine contracts have been mainly those in which the contracts were with enemy subjects for the delivery of metals or ores, some of them such as that of the Zinc Corporation, of great importance. These cases have disclosed the extent to which Germany had obtained the control of important metal industries.

WAR ITEMS.

Trading with the Enemy.—The "London Gazette" for May 24th contains additions to the list of persons and bodies in Mexico and Uruguay with whom trading is prohibited.

Exports to China.—In the "London Gazette" for May 24th there are some additions to the list of persons and bodies to whom exports to China may be consigned.

Bombs in Switzerland.—It is reported from Geneva that German-made bombs have been discovered in Switzerland which were intended for use by Italian anarchists in blowing up certain munition works and electrical installations.

Power Station Bombed.—In the course of a dispatch, dated May 23rd, from Headquarters in France, it was stated that four tons of bombs had been dropped "on the very important electrical power station at Kreusewald (just east of Saarbrücken)." "A boiler house was hit by one bomb, and another bomb caused a large cloud of steam to arise from one of the buildings."

The operation of bombing Kreusewald power station was repeated on the night of 27th-28th inst. Chemical works at Mannheim were also attacked.

Lighting Economy in Barracks.—An Army Council Instruction draws attention to the necessity for the exercise of the most stringent supervision over the use of gas and electric energy in barracks, hutted camps, and other military buildings, with a view to reducing consumption to the lowest possible limits during the present emergency. It is considered that generally in camps, &c., the number and power of lamps might be reduced in many cases, particularly in canteens and other special buildings and establishments, and steps should be taken locally to effect these reductions wherever possible. —*The Times.*

The After-War Appointments Department.—In connection with the setting up of the Training Committee of the Appointments Department recently created by the Government to assist in the resettlement of officers, the Aeronautical Institute of Great Britain, 3, Arlington Street, St. James's, London, S.W., is extending the educational facilities of its workshops with a view immediately to afford a practical educational centre for aeronautical technology and aircraft architecture. The feature of the new arrangements is that all those wishing to avail themselves of the facilities afforded can do so at their own time, either in the day or the evening. The courses, which are under Mr. L. Blin Desbleds, are available also to those already in the aeronautical industry.

Entertaining Wounded Soldiers.—Last Saturday afternoon a number of wounded soldiers from the Cosham, Foye, and Bannerleigh Hospitals were the guests of the ladies of the administrative staff of the Bristol Corporation electricity department at the Exchange, and were taken by horse brakes to Clevedon, a distance of 18 miles from hospital. The weather was ideal. A guest was specially allotted to each lady, and after a most enjoyable drive, tea, prepared by the ladies, was partaken of at Wickenden's Restaurant. Photographs of the party were taken in the copse close by. The party, including a few members of the male staff, numbered about 80, and on the return to Bristol hearty thanks were accorded to the ladies.

Exemption Applications.—At Burnley Tribunal, exemption to August 31st was given to an electrical engineer (37, B 1), who said his work was mainly maintenance work, and if he had to go into the Army the business would close. He pointed out that his workmen had been badged.

At Southwark, the National Service Representative has agreed to six months' exemption being granted, with leave to appeal again, to W. H. Donovan, manager and buyer, 36 years of age, fit for labour at home (C 3), of the London Commercial Electric Stores, Ltd.

At Swindon, a review was made of the case of W. J. Moran (37, C 1), electrician with Messrs. Bays & Co., given conditional exemption two years ago. Mr. E. Bays stated that Moran was the only electrician the firm now had. Two months were substituted.

At Dover, Military appeals against two drivers, one in Class B 1 and the other in B 2, of electrical scavenging vehicles, employed by the Corporation and exempted until July 27th, were dismissed.

At Southport, the exemption held by a fitter and repairer for 16 years engaged with the Corporation Tramways Committee, was withdrawn, he having been born on June 30th, 1886. It was intimated that the matter was now left with the Ministry of National Service whether he was called up or not.

The Southport Tribunal has given exemption until August 1st to enable a substitute to be obtained, to an engine driver (31) with the Birkdale Electric Supply Co.

At Southport, on a review, conditional exemption was withdrawn in the case of the electrician at the Prince of Wales Hotel (35, Class A), having charge of the electrical installation, and he was given until August 1st, with the intimation that every effort must be made to replace him.

At Swinton (Lancs.), an appeal was made for the retention of the electrical engineer (39, Class A) at a local works, stated to be responsible for the whole of the power plant and lights. It was considered expedient, despite his class, that he should remain in his employment. Three months were conceded.

An appeal was made at Burnley for a driver on the Corporation tramways (39, C 1), claimed to be in a certified occupation. Mr. Parker, National Service Representative, said that it was not in the national interest that a man of the category mentioned should be kept out of the Army. He added that it did not take long to train a driver. Mr. Jobling stated that the man had been in the tramway department for 14 years, and the Committee wished to keep their old experienced drivers. The man was exempted until July 31st, when he is to be regraded.

On a review, the Barking Tribunal have cancelled exemption held by J. W. Bristow (31, Class A), motorman on the trams, and he is to be called up within a month.

The East Kent Appeal Court heard an appeal by the Folkestone Electric Supply Co., Ltd., for A. J. Jenkins (30), chief clerk. Mr. T. Hesketh, for the company, said that they supplied the whole of the Military and Government departments, whilst the harbour relied on them for light. Col. Atkinson argued that the man was the clerk of an industrial concern. The Court dismissed the appeal.

Before the Dorset Appeal Court, further exemption was sought for T. H. Escott, manager for Brooking & Co., electrical engineers, of Weymouth. He was ordered to be regraded.

Before the Bucks Appeal Court, in the case of B. Bowditch (37, Grade 1), electrician, of Mintmore, it was stated that the Tring Rural Tribunal had reduced his conditional exemption to six months, and the Military appealed. The period was further reduced to three months.

At Calne, exemption was sought for A. H. Mackenzie (33, Class A), electrician in sole charge of the electric plant at the works of the Bacon Company. He was finally exempted until July 15th.

At Castleford, an appeal was made by C. J. Cox, stated to be the only man in the town doing electrical engineering repairs, and who is responsible for the upkeep of plant in many works in the district. Six months' temporary exemption was conceded.

Before the Herts Appeal Court, M. J. Connare (38, Grade 2), electrical engineer, of Watford, applying for a medical re-examination, claimed that he was in a certified occupation by virtue of his being a direct contractor for the War Office. The Chairman said they could do nothing for him. He had had two chances, one to go to the War Office for protection if he was doing what he said he was, and the other was that if he was in the list of protected occupations he was all right.

At Rotherham, E. W. Mitchell (18, Grade 1), assistant draughtsman in the Corporation electricity works, appealed as a conscientious objector, and said that he must admit that, in a sense, he was helping the war, because electric power was largely used in the manufacture of munitions. He offered to give up the work and go farming, but not to replace a man for active service. He was given conditional exemption on obtaining work of national importance through the Pelham Committee.

The East Kent Appeal Court has dismissed an appeal by A. W. Perry (42, Grade 1), chief clerk to the Isle of Thanet Tramways & Electric Light Co.

IMPORT TRADE OF CHINA.

The Chinese Imperial Maritime Customs have recently issued a volume giving the countries of origin of the principal imports into China during 1915-16. The following figures, showing the value of imports in 1915 and 1916 of goods of interest to the electrical engineering industry, have been extracted from this volume, and the increases and decreases are shown. It is to be noted that the average value of the Haikwan Tael in 1915 was 2s. 7¼d., and in 1916 was 3s. 3 13/16d.

	Hk. Tls. 1915.	Hk. Tls. 1916.	Hk. Tls. Inc. or dec.
Electrical materials and fittings.—			
From Great Britain ...	404,000	711,000	+ 307,000
,, Hong-Kong ...	260,000	340,000	+ 80,000
,, Canada	3,000	74,000	+ 71,000
,, Russia	30,000	20,000	– 10,000
,, Italy	20,000	34,000	+ 14,000
,, Japan	845,000	1,699,000	+ 854,000
,, United States ...	285,000	614,000	+ 329,000
,, Other countries ...	238,000	77,000	– 161,000
Total	2,085,000	3,569,000*	+ 1,484,000

* Includes 137,000 Hk. Tls. re-exported.

Copper, bars, rods, sheets, plates, wire, and nails.—			
From Great Britain ...	14,000	9,000	– 5,000
,, India	3,000	2,000	– 1,000
,, Russia	10,000	20,000	+ 10,000
,, United States ...	4,000	19,000	+ 15,000
,, Japan	204,000	347,000	+ 143,000
,, Other countries ...	15,000	19,000	+ 4,000
Total	250,000	416,000	+ 166,000

	1915. Hk. Tls.	1916. Hk. Tls.	Inc. or dec. Hk. Tls.
Railway carriages and wagons, including tramcars.—			
From Great Britain ...	106,000	54,000	– 52,000
,, Belgium	10,000	2,000	– 8,000
,, Russia	13,000	292,000	+ 279,000
,, United States ...	172,000	120,000	– 52,000
,, Other countries ...	335,000	201,000	– 134,000
Total	636,000*	669,000†	+ 33,000
* Includes 49,000 Hk. Tls. re-exported.			
† Includes 133,000 Hk. Tls. re-exported.			
Machinery, propelling (as boilers, turbines, &c.).—			
From Great Britain ...	313,000	322,000	+ 9,000
,, Italy	—	84,000	+ 84,000
,, Russia	127,000	4,000	– 123,000
,, Japan	76,000	34,000	– 42,000
,, United States ...	127,000	131,000	+ 4,000
,, Other countries ...	68,000	31,000	– 37,000
Total	711,000*	606,000†	– 105,000
* Includes 34,000 Hk. Tls. re-exported.			
† Includes 30,000 Hk. Tls. re-exported.			
India-rubber and gutta-percha manufactures, including shoes and boots.—			
From Great Britain ...	57,000	43,000	– 14,000
,, United States ...	42,000	63,000	+ 21,000
,, France	32,000	34,000	+ 2,000
,, Russia	90,000	66,000	– 24,000
,, Japan	287,000	195,000	– 92,000
,, Other countries ...	31,000	20,000	– 11,000
Total	539,000	421,000	– 118,000
Telegraph and telephone materials.—			
From Hong-Kong ...	79,000	13,000	– 66,000
,, Great Britain ...	171,000	88,000	– 83,000
,, United States ...	23,000	66,000	+ 43,000
,, Denmark	2,000	25,000	+ 23,000
,, Japan	65,000	378,000	+ 313,000
,, Other countries ...	70,000	41,000	– 29,000
Total	410,000	611,000	+ 201,000
Aluminium, manufactures of.—			
From Great Britain ...	1,000	—	– 1,000
,, United States ...	1,000	7,000	+ 6,000
,, Russia	1,000	—	– 1,000
,, Japan	7,000	25,000	+ 18,000
,, Other countries ...	—	5,000	+ 5,000
Total	10,000	37,000	+ 27,000

LEGAL.

A.E.G. British Companies to be Wound up.

In the Chancery Division on Tuesday, Mr. Justice Younger had before him the petition of the Board of Trade to wind up under the Trading with the Enemy (Amendment) Act, 1916, the A.E.G. Electrical Co. of South Africa, Ltd.

Mr. Austen-Cartmell said this was one of the group of companies controlled by the A.E.G., a well-known enemy concern, and practically the whole of the shares were held by the German company, and the business was controlled by that company. At the outbreak of the present war the capital was £100,000, 19,995 of the 20,000 shares being held by the German company. Of the remaining five, one was held by a German, and four by persons with addresses in England. A vesting order was made, and the custodian had transferred the whole of the shares into his name. Formerly the directors were two English, and two resident in Berlin, but latterly three were resident in Germany. The main sphere of the company's operations was in the Union of South Africa, and it dealt in electrical appliances, and supplied power installations. The assets and liabilities in South Africa had been dealt with by a firm appointed for the purpose in that country, and they had in hand about £500 or £600. In England £16,000 had been handed over to the Public Trustee, and there was in hand £4,000. The sum of £48,000 was claimed by the English business as against the German company, and £81,000 was stated to be due by the South African Co. to the German company. These companies, said counsel, were formed solely for running the business of the German company in Great Britain and the Dominions, and the Board of Trade now asked that, the business having been disposed of, the company itself should be wound up.

His Lordship said he thought this a very proper case for a winding up, and made the order.

His Lordship made a similar order in the case of the Electrical Co., Ltd.

Mr. Austen-Cartmell said this was another of the group of three companies controlled by the A.E.G. In this case, out of a total of 20,000 shares, 19,991 were held by the German company. The company was incorporated in 1892 to take over another business which had been acquired by the A.E.G., the directorate being identical. This company was engaged in wholesale trade in electrical appliances only in this country. The third company, which would have to be dealt with later, the A.E.G. Electrical Co., Ltd., carried on business anywhere. In the present case the controller had handed £46,000 to the Public Trustee, and there was £3,000 in cash. The sum of £20,000 was alleged to be due to the German company.

His Lordship made the order as stated above.

Stevens v. Telegraph Construction & Maintenance Co., Ltd.

In the City of London Court, on May 27th, before his Honour Judge Atherley-Jones, K.C., this case under the Workmen's Compensation Act was mentioned. Applicant, Alice Ellen Stevens, coil tester, made a claim through her father, as her next friend, against the respondents, for damages sustained through an accident that befell her while working for them on November 23rd at Enderby's Wharf, East Greenwich, when she received an electric shock. She was injured by catching hold of a live cable, suffering burns on the thumb, and the middle, ring, and little fingers of the left hand. She was still totally incapacitated, but anticipated that in three months she would recover sufficiently to resume work. Her wages had been 30s. per week.

Miss Stevens said that the insurance company had now stopped the 16s. half wages which she had received as part compensation. The respondents had now paid £45 into Court, which she was prepared to accept in full satisfaction of all her claims, and she asked that the money should be paid out to her.

Judge Atherley-Jones said he could not accede to such a suggestion, as the girl was under age.

Her father pressed the Judge for payment of the money, and said he had been keeping his daughter for the past seven months. Her hands were so much injured that she could not do any work yet.

Judge Atherley-Jones: Then you should not have accepted the £45 if the girl cannot work. I cannot hand the money over to you. You can have £10, but I shall not do any more.

The Father: Can't I have my day's expenses?

Judge Atherley-Jones: I have no power to give it you. You can take it out of the £10. The balance will remain in Court for the girl's benefit later on.

BUSINESS NOTES.

Trade Announcements.—Messrs. Fyfe, Wilson & Co. have removed to new offices at 133, West Campbell Street, Glasgow. Their telephone numbers and telegraphic address are unaltered.

Mr. G. W. Warriner, electrician, of 14, Parliament Street, York., announces that he is giving up the business, owing to his premises having been taken over by the Government.

The London Electric Firm, of Brighton Road, Croydon, are now making, and are able to supply, gun-metal, brass, and aluminium castings in their new model foundry.

Millns Electrical Co. have this week removed their offices and works from Strand to 17, Whitefriars Street, E.C. 4.

Australian Contracts.—An Act which has recently been passed by the Government of Victoria relates to the purchase of goods, machinery, or materials for works undertaken by or on behalf of certain local authorities. Goods, machinery and materials, &c., to the amount of £250 and upwards, required by local authorities are to be purchased from the manufacturers, &c., in the Commonwealth, unless it can be shown that they are unprocurable, or procurable at an unreasonable price or within an unreasonable time, &c. No goods to which the Act applies may be imported except under a certificate from the responsible Minister.—*Board of Trade Journal.*

Moonlight Chart.—Messrs. C. A. Vandervell's moon chart for June, compiled by their chief engineer, Mr. A. H. Midgley, has come to hand.

Trade Inquiries.—A firm of engineers at Santander, Spain, desires to take up agencies for all Spain, for United Kingdom manufacturers of electric plant and steam turbines. [Reference No. 138].—*Board of Trade Journal.*

Liquidations.—Bosch Magneto Co., Ltd., London.—First and final dividend of 20s. in the £, payable at the office of the Official Receiver and Provisional Liquidator, 33, Carey Street, W.C. 2.

Malta Tramways, Ltd.—Voluntary liquidation. Mr. J. R. Tulloch, 4B, Frederick's Place, Old Jewry, E.C., liquidator. Meeting of creditors June 5th.

W. P. Theermann & Co., Ltd.: Manchester.—The Controller, Mr. W. Eaves, 15, Fountain Street, Manchester, has applied for his release.

Southport Tramways Co., Ltd.—Winding up voluntarily. Messrs. T. Bower and H. A. Stagg, Manchester Hotel, London, E.C., liquidators. Meeting of creditors, June 10th.

American Price for Copper.—The New York correspondent of the *Times* states that the War Industries Board has continued the fixed price of copper at 23½ cents for 75 days, but some producers have refused to accept this figure, and expect to gain a system of differentials benefiting those who produce at a high cost.

Chile.—With a view to giving effect to the general desire for the development of the iron and steel industry in Chile by the opening of many fresh ironworks, the Empresa de los Altos Hornos de Corral has applied to the Chilean Government for a loan of 10,000,000 pesos, offering as guaranty its properties, concessions, and future income. The application has the support of the Sociedad de Fomento Fabril (Industrial Development Society), and will probably be granted.

Italy.—The Conti Electric Co., of Milan, has voted the increase of its capital from 30,000,000 to 46,000,000 lire to defray the cost of various extensions under way and projected. The Società Emiliana, of Parma, has issued fresh capital of 1,400,000 lire in order to develop tramways in Parma and province in conjunction with the Compagnia Nazionale di Transporti e Comunicazioni. The Società delle Tramvie e Ferrovie Elettriche di Roma has increased its capital from 3,500,000 to 8,250,000 lire, and the Società Anonima Brevetti Perego, of Milan, has doubled its capital to 1,000,000 lire.

For Sale.—Hull Corporation electricity department has for disposal a quantity of plant (generator sets) removed for the installation of larger units. Particulars are given in our advertisement pages to-day.

LIGHTING AND POWER NOTES.

Arklow (Co. Wicklow).—Public Lighting.—The Council has appointed a deputation to wait on Messrs. Kynoch, with a view to having the town lighted by electricity.

Batley.—Price Increase.—The Corporation electricity department has given notice that from July 1st the charges will be increased as follows:—For lighting by 5 per cent. on present rates (*i.e.*, 20 per cent. on pre-war charges); for power and heating by 12½ per cent. on present rates (*i.e.*, 40 per cent. on pre-war charges).

Bury.—Year's Working and Price Increase.—The result of the year's working of the Corporation electricity works shows a profit of £1,626. A sum of £1,000 was placed to the relief of rates, and the balance to the reserve fund. The Electricity Committee has decided to increase the charge for electricity by a further 10 per cent. as from July next.

Caerphilly.—Public Lighting.—The U.D.C. has accepted the terms of the South Wales Electric Power Co. for public lighting at Nelson. The existing lamps are to be converted to electricity, and are to be lit at £2 10s. per 50-c.p. lamp per annum, with the addition of the war emergency charge of 25 per cent., subject to increase or decrease according to fluctuations in prices.

Dublin.—Electrical Power at Dublin Docks.—At last week's meeting of the Dublin Port and Docks Board, the engineer reported that the work of providing electric power for the War Department hay-pressing installation at the North Wall Dock area would be done at the cost of the military authorities. Alderman Byrne, M.P., said the Corporation should get the same facilities for supplying electricity as the Dublin United Tramways Co., or any other body, and, as a member of the Corporation Electricity Supply Committee, he strongly objected to the action of the Government in pampering other companies against a popularly elected body. The chairman (Alderman Moran) said if they had the entire output of the Corporation power house at the North Wall it would not have a wheel, as the current was alternating, and the Tramway Co.'s current was continuous. "If the Corporation had the same facilities as the Tramways Co., could the Corporation do it then?" asked the Lord Mayor of Dublin (Mr. L. O'Neill). The chairman said they could if they could get rotary converters, and if they went to the expense of putting them down; but it would be very foolish to trouble in that way for the sake of what would be a temporary measure. As soon as the Corporation could supply energy to the area at the docks, he (Alderman Moran) would be the first to see that they would get what it was their right to get.

Edinburgh.—Electricity Supply.—A Conference was held, last week, between the E.L. Committees of Edinburgh and Leith, in reference to the supply of electric power and future developments. At present the stations of both Corporations are fully loaded, and it was suggested that if the Ministry of Munitions would consent to an instalment of the work of the new station at Portobello, Leith could be supplied from this station. A Committee was appointed to prepare a report on the proposals made at the Conference.

At a meeting of Edinburgh Corporation, later in the week, Mr. Bruce Lindsay moved a recommendation by the Electric Lighting Committee that a deputation urge on the Minister of Munitions the necessity of provision being made at an early date to meet the needs of their area of supply. It was stated to them in London on their last visit that if there was sufficient power in their stations for industrial purposes the Ministry of Munitions did not care a straw whether the city was lighted or in darkness. In the course of a discussion it was pointed out that the Government was holding its hand, and was waiting until some policy for the country at large had been formulated. The Lord Provost said they wanted one of the super-stations to be established in the Edinburgh area. Mr. Bruce Lindsay remarked that their station at Portobello fulfilled all the requisites of a super-station to the very utmost. The recommendation to send a deputation was adopted.

Heston and Isleworth.—Increased Power Demand.—The Electricity Committee of the U.D.C. reports that the increased demands now being made upon the electricity undertaking for power have necessitated consideration of the question of increasing to the utmost the efficiency of the plant at present installed at the electricity station. The Committee has directed that combustion chambers be fitted to the boilers at present heated by the refuse destructors. By this means the boilers in question will, in cases of necessity, be heated by coal fires in addition to the heat derived from the destructors.

Keighley.—Wages Advances.—Wages advances recommended by the Corporation Electricity Committee are as follows:—Men aged 18 and over, from 15s. to 19s. per week above pre-war rates; men under 18, 2s. per week advance, with a maximum of 10s. per week over pre-war rates. The increases to be regarded as war wages, and payable on overtime and night duty, Sundays, and Bank Holidays, commencing as from the first full pay-day after March 21st, 1918.

London.—St. Pancras.—The chief electrical engineer reported, with reference to the proposed installation of two additional 3,000-kw. Ljungström turbines at the King's Road station, that he applied to the Ministry of Munitions for sanction to this work being carried out, and had been informed that they were only prepared to consider an application for one set. He had also approached the Coal Controller, who stated that he could not support the application for the two turbines. If one set only were proceeded with, the estimated cost would be £24,800, as against £41,900 for the two sets, in consequence of all the pipe work and circulating water arrangements having to be the same for one set as for two. The Electricity Committee has considered the foregoing, and decided that as soon as the approval of the Ministry of Munitions is received, a contract be entered into with the Brush Electrical Engineering Co., Ltd., to provide either one or two Ljungström turbines, at a cost of £17,900 each.

Manchester.—Annual Estimates.—The estimates of the Corporation Electricity Committee for the year ended March 31st, 1919, show proposed capital expenditure £240,000, made up as follows:—Generating stations: land, buildings, machinery, &c., £140,000; distributing stations: land, buildings, machinery, &c., £36,000; mains and services, £63,500; motors, £500; as compared with a total approximate expenditure of £245,958 for 1917-18.

Nuneaton.—Year's Working.—At a meeting of the Town Council, it was reported that the accounts for the past year of the electricity undertaking showed a loss of £2,000. Alderman Melly stated that at the next meeting of the Committee it might be necessary to increase the charges.

South Africa.—Johannesburg.—Press dispatches show that, during the past week, the success of the Johannesburg electricians in the recent strike has led to agitation among miners and mechanics working in the Witwatersrand mines, whose Federation holds that they are entitled to the same rate as the electric power station men (£8 10s. weekly). A mass meeting of Trade Unionists was held on Sunday. Other reports show that the Johannesburg strike has been resumed. It is stated that the Municipal Council agreed to the strikers' terms with the greatest reluctance; the voting in favour of acceptance was 14 votes and 13 against. It was feared that had the strike continued it would have then involved the men engaged in the mines, which, apparently, it has now done, and the employés at the Victoria Falls Power Works.

Worcester.—Street Lighting.—The Watch Committee has decided not to use the street electric arc lamps in June, July, and August, excepting for the dark hours, in the centre of the city.

TRAMWAY AND RAILWAY NOTES.

Burton-on-Trent.—A Burton and Ashby electric light-railway car was struck by lightning whilst travelling through the fields between Bretby and Sunnyside, and caught fire, which was extinguished by sand.

Canada.—Increased Wages.—The employés of the Montreal Tramway Co. having failed to obtain increased wages have threatened to strike; the Mayors of the different municipalities served by the tramway are considering the suggestion of the company that they should be allowed to charge a fare of 2½d., so that the increase may be granted.

Croydon.—Obstinate Drivers.—According to the *Evening News*, two tramcars met on a single track at Northcote Road, and neither driver would give way; the traffic was consequently held up. The drivers, who each accused the other of being in the wrong, for 20 minutes treated a policeman's order with indifference. The men were summoned on Tuesday for improperly delaying the cars. It was stated that both had since been discharged. Both men were fined; one who should have retired was ordered to pay 40s., and the other 20s.

Continental.—Italy.—There has been formed at Bergamo the Società Anonima Ferrovia Valle Seriana, with a capital of 5,000,000 lire, with the object of taking over the concession of the General Economic Railway Co. of Brussels, for the Seriana railway line and its lengthening to Bondione; also that of the Ponte Nossa to Clusione line from the company of the same name, and electrifying the same.

Elland.—Storm Damage.—A tramcar on the West Vale route was struck by lightning during one of the severe storms which swept over the West Riding last week. No personal injury resulted, but the car was disabled and had to be towed back to the sheds, and the two cars which undertook this work were somewhat damaged in the course of the stiff climb up the Ainleys. Between Cowlersley and Slaithwaite the heavy rain washed sand from the hills on to the rails on three sections of the route, and the service of cars was disorganised.

Fuel Economy.—According to the *Journal* of the Tramways and Light Railways Association, referring to the Order of the Tramways (Board of Trade) Committee that tramway undertakings must reduce their coal consumption at once by at least 15 per cent., the following means of economising coal are suggested:—(1). Reduction of services not required in the national interest. (2). Withdrawal of services either for a part or the whole day on Sundays. (3). Stopping all services at an earlier hour in the evening. (4). Partial substitution of coke, locally produced, for the coal at present consumed. (5). Grant of a bonus to motormen for economy in power consumption.

Glasgow.—Traffic Returns.—The revenue of the Corporation tramways to date for the current financial year, up to within a fortnight of its close, amounts to £1,349,081, being an increase over the corresponding period of the previous year of £153,904, or a weekly average increase throughout the year of over £3,080.

London.—Tramway Receipts.—The L.C.C. tramway receipts for the week ended May 22nd amounted to £72,085, compared with £55,036 in the corresponding week last year. The receipts include money taken on five days under the new fare scales, while Whit Monday is also included, and these factors to some extent account for the large increase.—*The Times.*

It is stated that for the first time for many years the Waterloo and City Railway under the Thames is being repaired. The work consists of renewing piping, &c., for the pumping machinery which takes care of the drainage throughout the whole length of the tunnel. The work is carried on at night when the traffic is stopped. The pumps are all electrically controlled, and operate automatically.

Mexico.—New Railway.—An application is pending before the Department of Communications and Public Works for the construction of an electric railway connecting Tampico with Mexico City, passing through the capitals of the States of Vera Cruz, Tlaxcala, and Puebla, as well as many other important towns.

Southend.—Parcel Service.—With regard to the inquiry of the Board of Trade as to the possibility of establishing a parcel delivery service as an auxiliary to the tramway service, the Light Railways Committee has come to the conclusion that it has no facilities for complying with such a scheme.

TELEGRAPH AND TELEPHONE NOTES.

Brazil.—According to a U.S. Consular report the Government-owned telegraph lines of Brazil presented a marked improvement during 1917 as compared with previous years. The receipts have increased from $3,787,685 in 1913 to $4,324,587, and the expenditure has diminished from over $7,000,000 to $4,816,817 in 1917, while the deficit has been reduced from $3,280,048 to $492,230.

Mexico.—A new wireless station has been established on the Island of Lobos, off the coast of Tampico, largely for the purpose of affording the various petroleum companies facilities for communicating with their vessels over great distances at sea. This station will be able to communicate with the wireless stations at Mexico City, Tampico, Vera Cruz, &c., and by way of Havana with various stations in the United States. It is expected to prove of great value in advancing the commercial interests of the Republic.

Spain.—In our issue of May 10th we mentioned that wireless telephone installations had been placed on board the two Spanish merchant boats *Jaime I* and *Raimundo Lulio*. The trials since carried out at a distance of 100 miles apart have proved very successful, and other boats at Bilbao and Barcelona are being fitted up with the apparatus. The makers of the plant, La Compania Iberica de Telecomunicacion, of Bilbao, declare this to be the first successful wireless telephone installation in the world. The Spanish Admiralty has followed the trials with interest, and it is hoped will lend its aid for further experiments.

Telegram Delivery.—The Postmaster-General has again drawn the attention of those with registered abbreviated addresses to the advantages of receiving by telephone telegrams directed to an abbreviated address. An appreciable saving of time results from this method of delivery, and it also sets free boys for other work. Any registrant willing to accept delivery of his telegrams by telephone should communicate in London, Dublin, and Edinburgh with the Secretary, and in the Provinces with the postmaster of the town at which his address is registered.

The Postmaster-General announces that on and from June 1st next the charges for recording instructions in connection with the delivery of telegrams (in addition to the charge of one guinea a year for a registered telegraphic address) will be as under:—

(*a*) Five shillings for each special instruction relating to the delivery of telegrams bearing a registered abbreviated telegraphic address.

(*b*) One shilling for each instruction relating to a change of address, whether for telegrams bearing a registered address or a full address. If the record is required for a longer period than one calendar month, one guinea a year will be payable.

Wireless Strike.—As briefly mentioned in our last issue, the operators represented by the Association of Wireless Operators have given notice to cease work at the end of next week. Their grievance is the delay of the National Wages Board of the Ministry of Shipping in dealing with their claim to increased wages, the only increase so far granted having been 5s. a week in October last. An operator starts at £5 a month, rising to £6 by two annual advances.

CONTRACTS OPEN AND CLOSED.

OPEN.

Ashton-under-Lyne.—June 5th. Engine slack for Electricity Committee. Borough Electrical Engineer, Wellington Road.

Belfast.—June 7th. Electricity Department. 9,000 yd. of 6-core 0·1 sq. in. lead-covered, paper-insulated cable, and laying. See "Official Notices" May 24th.

Erith.—Electricity and Tramways Department. 500-kw. rotary converter with transformers, switchgear, &c. See "Official Notices" May 17th.

Glasgow.—June 4th. Electricity Department. 30,000 tons of coal (singles and pearls). Mr. W. W. Lackie, 75, Waterloo Street.

Newcastle-under-Lyme.—Electricity Department. One 150-kw. rotary or motor-converter set and switchgear. See "Official Notices" May 24th.

South Africa.—June 10th. South African Railways and Harbours Administration. 59,500 incandescent train lighting lamps with solid wire drawn tungsten filament; 30,761 incandescent lamps with solid wire drawn tungsten filament; and 3,600 incandescent lamps with carbon filament. (Tender No. 151.) Secretary to Tender Board, South African Railways Headquarter Offices, Johannesburgh.

A copy of the specification, &c., may be consulted by British firms interested at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence).

Warrington.—June 18th. Electricity and Tramways Committee. High-tension lead-covered cable and medium-tension rubber-covered cable. See "Official Notices" to-day.

CLOSED.

Glasgow.—The Tramways Committee recommends acceptance of the offers of Hadfields, Ltd., and Edgar Allan & Co., Ltd., for special track work, also that contracts be entered into with the following (for six months in the majority of cases):—

Steel axles, tires, and wheels.—H. Bessemer & Co., Ltd., and Brown Bayley's Steel Works, Ltd.
Chilled-iron brake blocks (three months).—Carron Co.
Fire-clay goods (six and 12 months).—Spiers, Gibb & Co.; Glenboig Union Fire-clay Co., Ltd.
Rubber and asbestos goods.—N.B. Rubber Co., Ltd.; Clyde Rubber Works, Ltd.; George M'Lellan & Co.; Rubber Co. of Scotland; J. T. Goudie and Co.

The Electricity Committee has accepted the following tenders:—

Cast-iron boxes, section pillars, &c. (for six months).—Carron Co.; Falkirk Iron Co., Ltd.; Lion Foundry Co., Ltd.
Electricity meters.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.; British Westinghouse Co., Ltd.; Aron Electricity Meters, Ltd.
Single cables.—Callender's Cable Co., Ltd.
Concentric and triple-concentric cables.—Callender's Cable Co., Ltd.
H.T. cables.—W. T. Glover & Co., Ltd.
S.H.T. cables.—Callender's Cable Co., Ltd.
Rubber-covered cables and flexibles.—Craigpark Electric Cable Co., Ltd.

FORTHCOMING EVENTS.

Salford Technical and Engineering Association.—Saturday, June 1st. Visit to Messrs. Matthews & Yates, Ltd., Cyclone Works, Swinton.

Roentgen Society.—Tuesday, June 4th. At 8.15 p.m. At the Royal Society of Arts, John Street, Adelphi. Annual general meeting. Paper on "An Investigation of the Photographic Action of X-rays," by Mr. N. E. Luboshey.

Chief Technical Assistants' Association.—Thursday, June 6th. At 6.15 p.m. Paper on "Distribution Faults and their Location," by Mr. Ingram.

NOTES.

Official and Small Advertisements.—Provincial readers will oblige by posting their communications early on Wednesday, so as to ensure their arrival by the first post on Thursday, as there is sometimes considerable delay in the postal deliveries.

Electric Power Supply.—On the point of going to press, we learn that the Report of the Board of Trade Electric Power Supply Committee has been issued. (Cd. 9,062. Price 3d. net.) The Committee recommends the establishment of a national system of electric power supply, controlled by a body of State Commissioners, and administered by District Boards, who would be responsible for the generation and distribution of electricity in their several areas.

The Commissioners would take over the existing powers of the Board of Trade, Local Government Board, L.G.B. for Ireland, and Scottish Office, with large additional powers; the existing system of generating electricity separately for small areas would be abolished, and the District Electricity Boards would purchase all generating stations of authorised distributors in their areas, but existing undertakers would, if they so desired, retain the distribution within their respective areas. The Boards would make no divisible profits, and would be financed by funds raised with Government assistance. Largely extended powers would be granted for the use of overhead wires, wayleaves, and the acquisition of water rights.

On the evidence submitted, the Committee unanimously concludes that the present system is contrary to the national interest, wasteful of fuel resources, and detrimental to industry. It recommends immediate action, in the interests of industry, and that the Government should provide funds for the purpose.

Volunteer Notes.—LONDON ARMY TROOPS COMPANIES, VOLUNTEER ENGINEERS.—Headquarters: Balderton Street, Grosvenor Square, W. 1.

Orders for the week ending June 9th, 1918, by Lieut.-Colonel C. B. Clay, V.D., Commanding.

Captain of the Week.—Capt. W. Hynam.

Next for Duty.—Capt. W. Darley Bentley.

Monday, June 3rd.—No. 3 Company, 6.30—8.30, Recruits' Drill, 6.30—8.30. Signalling Section, 6.30—8.30.

Tuesday, June 4th.—Lecture on "Demolitions," 6.30. Physical Drill and Bayonet Fighting, 7.30.

Wednesday, June 5th.—No. 1 Company, Drill, Knotting, &c., 6.30—8.30. Recruits' Drill, 6.30.

Thursday, June 6th.—No. 2 Company, Drill, Knotting, &c., 6—8. Recruits' Drill, 6.30. Signalling Section, 6.30—8.30. Ambulance Section, 6.30—8.30. First Field Dressing Demonstration, 6. Band Practice, 7.

Friday, June 7th.—Musketry for the whole Corps, 5.30—8.

Saturday, June 8th.—Entrenchments, &c., for the whole Corps, 2.45—4.45. Recruits' Drill 2.45—4.45.

Sunday, June 9th.—Commandant's Parade at Waterloo Station, 8.45 a.m., for work at Esher. Drill order, with haversacks and water-bottles. Rifles. Mid-day and tea rations to be carried.

C. HIGGINS, *Capt.* R.E., T.F., *Adjutant.*

A Professional Workers' Union.—After conferences in which representatives of many organisations took part, a Federation of Professional, Clerical, and Technical Workers has been formed "to assist in maintaining and improving the economic conditions of members; to discuss policy on subjects of common interest, and, where necessary, to take joint action; to arouse general interest on important professional matters affecting particular organisations, and generally to secure the unity of members in all social activities." The hon. secretary is Mr. F. H. Norman, Westfa, Princes Park Avenue, N.W. 4.—*The Times.*

A 75,000-H.P. Turbo-generator.—According to the *Daily Mail* the German A.E.G. asserts that it is now building the largest and most powerful turbo-generator ever constructed. It will generate 50,000 KW., representing 75,000 H.P. The German Press acclaims the feat as a "colossal achievement" in the midst of war and in view of the shortage of important raw materials, especially nickel. The German Press may be interested to learn that turbo-generators of 50,000, 60,000 and 70,000 KW. are being built in the United States.

The Electric Heating of Moulds.—In a paper to be read at the spring meeting of the American Society of Mechanical Engineers next week, Mr. H. E. White describes the application of electric heating to moulds for the forming of synthetic insulating materials to shape. These materials soften sufficiently at a moderate temperature to take the shape of the mould, and when heated to a higher temperature undergo chemical changes which harden them. Live steam had been used for heating the moulds, which were afterwards cooled with water, but the process was slow and liable to interruption through leakage, &c. Electric heating was tried, and proved so successful that the use of steam was abandoned. The method adopted was that of magnetising the moulds with alternating current by the induced eddy currents and hysteresis, the steel moulds being encircled with a coil of 100 turns of No. 6 asbestos-covered wire, connected to the 220-volt supply mains. Moulds weighing 10 to 15 lb. were brought up from cold to the curing temperature in three to five minutes by this means, the magnetising coil remaining quite cool. The attainment of the right temperature was indicated, in the first instance, by the colour of sulphur melted in contact with the mould, or by the charring of cane-sugar syrup mixed with a little blue litmus. Illustrations in the paper show how the coil was best applied, in two sections, one on each part of the press, so that the moulds could be put into the press as easily as in the case of an ordinary press. The faces of the press were laminated to reduce heating where it was not required, and the author considered that more than half the heat developed appeared in the mould. With this method of heating, several moulds could be piled one on top of the other and all heated at once; the moulds also could be of the simplest form and very inexpensive. The method could also be applied to die castings of readily fusible metal, tempering steel, &c.

"Attracted" the Lightning.—According to the *Sussex Daily News*, during a recent thunderstorm a discharged soldier, Mr. H. C. Fowler, had a narrow escape from death. He had been undergoing electrical treatment to his right arm, and a flash of lightning, *apparently attracted by the electricity in his body*, struck him, spun him round, and threw him to the ground, rendering him unconscious. His right arm was drawn up to his shoulder, and remained a fixture. He was taken to the Military Hospital, where he was treated by Capt. Ray, and had to have his arm forced down. It is feared the limb will always be affected in consequence. Apparently the victim—one of our Mons heroes—had not been completely discharged, after all.

The Electric Vehicle Committee.—The Electric Vehicle Committee, acting in conjunction with the Accumulator Makers' Section of the British Electrical and Allied Manufacturers' Association, having represented to the Controller of the Priority Department of the Ministry of Munitions the desirability of increasing the amount of new lead allowed to be used in the repair and maintenance of batteries under the Special Battery Permit issued to the accumulator manufacturers, where batteries for electric vehicles are concerned, the Controller has now consented to an addition to Clause 15 of the Special Battery Permit held by members of the Accumulator Makers' Section of the B.E.A.M.A., to come after the words: "Not exceeding 1 cwt.," the words "Or in the case of electric storage batteries used as the motive power for propelling electric vehicles 3 cwts., and provided always, &c." This addition has been designed to enable accumulator manufacturers, who are makers of electric storage batteries for use on electric vehicles, to repair and maintain the same without the necessity of individual application for permits being made to the Priority Department.

Electrical Trades Union.—The annual conference of the Electrical Trades Union was held in Blackpool during Whit week, under the presidency of Mr. W. J. Ball, of Manchester. Some 23,000 members of the electrical trades were represented, some 200 delegates being present. On Thursday, last week, an important step was taken with reference to Man Power. The conference sent a telegram to the Minister of Munitions, pointing out to him the injustice to members of the Union through the revision of the list of protected occupations, and requesting him to meet a deputation. A reply was received, agreeing to meet a deputation in London during the present week.

Composite Insulating Materials Investigation.—A Joint Committee representing the Institution of Electrical Engineers and the British Electrical and Allied Manufacturers Association, appointed under arrangements with the Department of Scientific and Industrial Research, has been considering a draft specification applicable to composite insulating materials used for electrical work in general (exclusive of vulcanised material), and invites manufacturers of such to consider the supply to the Committee of a series of moulded test specimens of their products, which would be paid for.

The principal object of the tests is to obtain figures for existing standard grades of composite insulating materials now on the market, from which data will be available for filling in the draft specification. A set of moulds is now being completed for use in making the specimens. It is probable that priority will be obtainable for this work.

Manufacturers who have not already communicated with the Institution can obtain full particulars from the Secretary.

The I.M.E.A. Meeting.—We have received, at the moment of going to press, the programme of arrangements for the annual meeting, which is to be held at Manchester on June 20th and 21st. After the welcome by the Lord Mayor, Mr. Watson will read his presidential address, and Mr. Pearce will follow with his introduction of the discussion on "The Future of Electric Power Supply." After the adjournment the afternoon of Thursday, June 20th, will be devoted to visits to Stuart Street station and the Westinghouse works. A concert at the Engineers' Club will be held at 8 p.m. On Friday the discussion on electric power supply will be resumed and the annual general meeting will be held.

Electric Power Supply of Great Britain.—A pamphlet with this title, containing a report of the debate which was held at the Engineers' Club, Manchester, on March 5th, 1918, on the interim report of the Coal Conservation Sub-Committee has just been issued. Copies may be had on application to the Hon. Secretary, the Engineers' Club, Manchester, price 4d. each, including postage.

London Association of Foremen Engineers.—At the sixty-fifth anniversary festival of the Association, which took place recently, the attendance of members and visitors was so large that an overflow hall had to be utilised. The gathering was presided over by Sir Hugh Bell, the vice-chairman being Mr. Anthony A. A. Byrd, President of the Association. Dr. Addison, Minister of Reconstruction, sent a telegram expressing regret that he was prevented from attending the dinner.

The chairman addressed a telegram to the King, expressing the loyalty and devotion of the members of the Association, and asserting their determination to exert every effort to maintain the output of munitions and other supplies necessary for the attainment of a decisive and lasting peace, and a reply from the King's Private Secretary expressed his appreciation of their loyal and patriotic assurances.

Proposing the toast of the "Allied Forces," Lieut.-Col. Norton Griffiths warned the company against the dangers arising from insidious German peace propaganda. Victory alone could ensure the future peace and prosperity of the world.

Mr. Robert F. Skinner (the American Consul-General), quoting official American figures, said the total amount of their steel construction programme on March 1st was 8,205,708 dead-weight tons. Of this total approximately 28 per cent. had been completed. The amount of floating tonnage exceeded the American total output in 1916 by approximately 50 per cent.

The chairman, in proposing "Prosperity to the London Association of Foremen Engineers," said that one of the difficulties to be overcome in the conduct of business was for employer and employé to understand the point of view of the other side. They must all bear in mind that the point was the cost of the finished article, and not the cost of the men's time. How many disputes would disappear if they would only remember that! To those who stood between the employer and the employed, like the foremen engineers, they owed a debt of gratitude which it was quite impossible to exaggerate.

Mr. James Harrington responded on behalf of the Association, and announced donations to the Association's Superannuation Fund of £430.

Mexican Ores.—Investigations have disclosed the presence in Sonora of extensive deposits of sulphate of molybdenum and of tungsten. These deposits will be developed upon an extensive scale.

Legal.—The Assault on a Non-Union Man.—At the Clerkenwell Sessions, on Wednesday, before Sir Robert Wallace, K.C., and a jury, Albert Ed. Owen and Geo. Wm. Turner, both in the employ of the New System Private Telephone Co., Ltd., of Great Portland Street, W., were indicted on a first count—"That on April 29th they used violence to or intimidated or followed with two or more persons in a disorderly manner in or through Euston Road one Albert Edward Muller, with a view to compel him, the said Albert Edward Muller, to abstain from doing an act which he had a legal right to do—namely, to follow his lawful employment." There was a second count against Albert Ed. Owen of having committed a common assault on Albert Edward Muller. Mr. Patrick Hastings appeared as counsel for the prosecution, and Mr. Zeffertt, barrister, again represented the prisoners, who had been out on bail. The proceedings at the Police Court have already been reported in the Electrical Review.

At the outset of the proceedings, Mr. Zeffertt objected to the first count, and Mr. Hastings said he thought the objection could be met by making it one of intimidation only. This Mr. Zeffertt said he could agree to, but it meant that there would have to be separate counts, and they could not be tried together.

Sir Robert Wallace, K.C., said that would be so, and to avoid any further trouble perhaps the case against Owen could be taken first and the other one adjourned.

Mr. Zeffertt said he did not want any adjournment.

Mr. Hastings said if his friend would agree to the trial of Owen alone it would meet the case, as, if the defence succeeded, nothing further would be heard of the case against Turner. This course was agreed upon, and Turner was ordered to leave the box, and released on his own recognisances. The trial of Owen was proceeded with. Mr. Hastings then addressed the jury.

After a very full hearing, Sir Robert Wallace addressed the jury, and said they had nothing to do with Trade Unionists or non-Trade Unionists. A man was entitled to join them or leave them alone in this country. All they had to decide was whether Owen deliberately struck this man or whether he was struck by Muller, and anything that followed was a general altercation. They had nothing to do in this country with Trade Union disputes when a case of common assault was in issue. They had the evidence of Turner that they were quite legitimately trying to persuade Muller to join the Union, and there was a little pushing. On the other side of the road was Owen and others, it was said, and it was alleged that Owen was beckoned for, and, coming up, deliberately struck the prosecutor. If they believed that story the consequences followed. The striking of his head on the kerb was the result of the blow, it appeared. Muller said there was no argument and no dispute. On the other hand, the defendant said that Muller was very offensive, and struck him. If that was true, there would not be much surprise if Owen struck back. One was not entitled to strike another man; but he left it to the jury to say whether it was surprising to do so under the conditions. It hardly mattered whether the telephone actually hit Owen, as it amounted to the fact that the man that started a row must not be surprised at what he got. His Lordship concluded by saying they were not trying Trade Unionism, but a common assault, and if they had the very least doubt about it, they would, of course, give the defendant the benefit of it.

The jury considered for about four minutes, and then found the prisoner "Guilty of a very serious assault."

Sir Robert Wallace said he presumed the object of the prosecution had been attained, and if the prisoner would agree not to molest or attempt to molest the prosecutor in any way, that was all they required.

Mr. Hastings: That is so.

Addressing the prisoner, Sir Robert Wallace said he quite agreed with the verdict—in fact, he might say absolutely. It was a very serious matter to interfere with a fellow-workman whether he was actuated by Trade Union motives or not. The question was whether he would agree not to molest again, in which case he would bind him over to come up for judgment if called upon.

The prisoner said he would willingly agree to that.

Sir Robert Wallace: If you violate that promise you will get six months' imprisonment.

Prisoner was then bound over.

Turner was then put in the dock, and, on his pleading "Not guilty," it was stated that the firm did not intend to proceed further with the prosecution.

Sir Robert Wallace accordingly discharged him.

The Foreman of the Jury: It is more than he deserves.

Appointments Vacant.—Engine drivers (45s. 4d.) for the Tunbridge Wells electricity works; fitter-driver for Diesel engines for the Sale U.D.C. electricity department; switchboard attendant (60s. + 12½ per cent.), charge engineer (£180 + 12½ per cent.) for the Derby Corporation electricity department; assistant electrical engineer and tramway manager (£200) for the Keighley Corporation electricity department; two junior engineers in charge (£2 + 20s. and 12½ per cent.) for the Bolton Corporation electricity department; test-room assistant (50s.), overhead lineman (56s. 4d.), skilled fitter as foreman for the Burgh of Kilmarnock electric lighting and tramway department; armature winder for the Rawtenstall Corporation tramways department; shift engineer (74s. 9d.) for the Hoylake and West Kirby U.D.C. electricity station; junior shift engineer for the Gravesend Corporation electricity department. See our advertisement pages to-day.

Institution and Lecture Notes.—Diesel Engine Users' Association.—At the May meeting of the Association, Mr. Geoffrey Porter referred to the importance at the present time of the great saving in the transport and consumption of coal effected by the use of oil fuel in Diesel engines in place of steam-generating plant. As the electricity supply undertakings that had installed Diesel engine plant were already effecting a saving in coal consumption far greater than the proportion aimed at by the Board of Trade in the recent Order of the Gas and Electricity Restriction Committee, he urged that such undertakings should be exempt from the operation of the Order. He proposed the following resolution, which was seconded by Mr. J. E. Edgecombe and unanimously passed by the meeting:—

"That application be made by the Diesel Engine Users' Association to the Gas and Electricity Restriction Committee of the Board of Trade to exempt from the provisions of the Lighting, Power and Heating Order, 1918, all public electricity supply undertakings in which Diesel oil engines are utilised."

It was further decided that copies of this resolution be sent to the Coal Controller and to the Institution of Electrical Engineers.

A paper by Mr. H. Moore on "Tar Oil in Diesel Engines" was read and discussed. Mr. P. H. Smith's paper on "Two Essential Conditions for Burning Tar Oil in Diesel Engines" was also presented, and is to be discussed at a later date.

Institution of Electrical Engineers.—The election of new members of Council has resulted as follows:—

President.—Mr. C. H. Wordingham.

Vice-Presidents.—Mr. W. A. Chamen, Mr. R. A. Chattock.

Hon. Treasurer.—Mr. J. E. Kingsbury.

Ordinary Members of Council.—Mr. H. W. Clothier, Mr. D. N. Dunlop, Sir R. A. Hadfield, Bart., F.R.S., Prof. E. W. Marchant, D.Sc., Mr. C. C. Paterson, O.B.E., Mr. J. Sayers.

At the meeting on Thursday, last week, the president announced that a Committee had been appointed to watch the proposals for rationing coal, gas, and electricity, and to place the views of the Council before the proper authorities.

The report of the Committee of the Students' Section states that the average attendance at the meetings has been 52, the highest recorded being 185. The opening address was delivered on November 23rd, 1917, by Sir Oliver Lodge, who gave a very interesting discourse on "Astronomical Applications of the Electrical Theory of Matter." The president (Mr. C. H. Wordingham) addressed the Section on March 22nd, 1918, when he discussed Labour problems, and in particular the organisation of the engineering profession. As in the two previous sessions, the Council decided not to award any premiums for students' papers this year. No visits or social functions have been held during the session. The Scottish and Newcastle Students' Sections have held no meetings during the session, but the Manchester Students' Section has held four general meetings. The Committee reports a considerable increase in the attendances at the general meetings, which is probably due in part to the holding of the meetings at the various colleges, necessitated by the occupation of the Institution buildings.

Decimal Coinage.—Lord Southwark has fixed the second reading of the Decimal Coinage Bill in the House of Peers for Tuesday next. Lord Leverhulme has given notice of his intention to move the rejection of the measure.—*Daily Telegraph.*

Proposed Engineers' Club for the Midlands.—A representative meeting was held on May 15th, at the Chamber of Commerce, Birmingham, in connection with the project for forming an Engineers' Club in the Midlands.

In opening the proceedings, the chairman, Dr. C. C. Garrard, M.I.E.E., remarked that in the future a great responsibility would rest upon engineers and upon all occupying leading positions in the engineering industry in connection with the work of reconstruction rendered necessary by the war. It was felt, however, that as a body engineers had not the power corresponding to their abilities. This was no doubt due to their being so scattered and split up into a large number of organisations which had very little contact with each other. It was felt that the first thing to do to get over this state of affairs was for engineers and those associated with them technically to get together and to know each other. The result would inevitably be co-operative action, which would undoubtedly result not only in advantages to engineers themselves, but in great benefit to the country.

Guided by these considerations, the idea had arisen to found an Engineers' Club in the Midlands. A very successful Engineers' Club was in existence in Manchester, and that club had intimated its willingness to render all the assistance possible in the founding of a similar club in Birmingham. The enthusiasm with which the idea had been greeted by everybody concerned showed that such a club could undoubtedly be formed successfully. It should offer all the advantages of a first-class social club, combined with facilities for meetings, lectures, &c. It was hoped that it would become the meeting-place of the various technical societies in the district.

The present scheme was part of a larger idea whereby such Engineers' Clubs would be founded in all the large engineering centres in the country. These, it was hoped, would eventually become federated together, so that members would not only have the practical advantages of the use of the club-houses in their travels, but the club would form a centre of engineering activities in each locality.

After discussion the following resolution was carried unanimously:—

"That a Midland Engineers' Club be founded in Birmingham, and that those present constitute themselves into a Provisional General Committee for the production of a scheme for such, with power to add to their number."

A "Finance and General Arrangements" Committee and a "Rules and Propaganda" Committee were then formed; Dr. C. C. Garrard, of the General Electric Co., Ltd., and Mr. J. Fearn, of the Birmingham Small Arms Co., Ltd., were elected provisional chairman and honorary secretary respectively. The latter invites gentlemen interested in this project to communicate with him.

We may point out that the formation of Engineers' Clubs is one of the items in Mr. Wordingham's programme, and that a similar project is being developed by the Newcastle Local Section of the Institution of Electrical Engineers, as reported in our last issue. The benefits to be derived from such institutions have been fully demonstrated by the remarkable success of the Manchester Club, and the movement should command the support of all engineers.

An Industrial "Safety First" Campaign.—In deference to a widely expressed desire for an Industrial "Safety First" campaign to apply to the whole of the United Kingdom, the London "Safety First" Council has taken the initiative by convening a conference, which will be held, under the patronage of the Lord Mayor, at the Mansion House, on June 12th, at 4 p.m. Lord Leverhulme, who will preside and speak on the subject of "Safety First" and its successful application at the Port Sunlight works, will be supported by personages influential in Government, Industrial and Labour circles.

The gratifying success which has attended the campaigns conducted by the London "Safety First" Council, by certain railway and transportation companies, and by industrial organisations in the country, has focused attention upon the incalculable benefits which would accrue from a general extension of the movement to the industrial community.

At no time in the history of the nation was the need for the conservation of human life more urgent, vital or opportune than at the present moment. The wastage caused by the most devastating war in the annals of the world has to be repaired. Innumerable industrial workers are concentrating upon supplying the needs of the men at the Front. Continuous work at high pressure has produced fatigue, and the resultant greater liability to accident. Accident prevention has, therefore, become, and will remain, an important factor in industrial and national progress, in that not only will thousands of valuable lives be saved, and untold human suffering be alleviated, but greater efficiency, increased production and economical working will be promoted to the mutual advantage of employer and employé.

The success of the American "Safety First" movement is irrefutable, and statistics show that industrial and transportation casualties have, in some instances, been reduced by nearly 50 per cent.

Applications for invitations to the Conference should at once be addressed to the Hon. Secretaries, London "Safety First" Council, 31, Westminster Broadway, S.W. 1.

Civil Engineers' Congress at Paris.—The Civil Engineers' General Congress was inaugurated on March 18th, when both the President of France and M. Clémental, Minister of Commerce and Industries, were present at the opening meeting held at the Sorbonne. M. Alexander Millerand, who presided over the work of the Congress, in his opening speech, emphasised the importance of the collaboration of science and industry, and the necessity of Capital and Labour working in harmony. The questions of apprenticeship and technical instruction were expounded by M. Léon Eyrolles, and amongst those who took part in the discussion were M. Kling, on reforms in the teaching of chemistry; M. Léon Guillett, on the revision of the programmes of higher schools and the alleviation of the studies of higher mathematics; and M. A. Rateau, on the formation of a higher institute of mechanics. Lieut.-Col. Renard then gave a *résumé* of the tendencies to which future technical instruction was leaning; the union or bringing into intimate contact of doctrines and realities, *i.e.*, recruiting professors from the professions which they taught. The Congress closed on March 23rd, when M. Mainié, President of the Tenth Section (Industrial Legislation), in his speech gave a *résumé* of the work of the Congress, and paid a tribute to the Press reporters, whose collective publications covered not less than 3,000 pages; the reports of the meetings included the full texts of all resolutions adopted. After going over the most important propositions made during the discussions, M. Mainié thanked the Society of Civil Engineers of France for its co-operation and assistance given to the Congress. He paid a tribute to the work of the organisers of the Congress, more particularly Messrs. Bodin and Barbet, to whom its success was largely due. The President, M. A. Millerand, then spoke of the praiseworthy work of the initiator of the Congress, M. Barbet, and all those who had contributed to its success. He recalled the promise, made at the inauguration, by M. Clémental, Minister of Commerce, that all resolutions adopted by the Congress would be referred to a Consultative Committee, composed of technical men and manufacturers, which would form a basis upon which to commence work. Further, a Permanent Commission, composed of the Board, Presidents of Sections, and general reporters, was to watch the progress made as a result of the work of the Congress; and to remind the Minister from time to time that French industry anxiously awaited the reforms upon which its future depended.—*Le Génie Civil.*

Electro-metallurgy in France.—In the course of his presidential address to the Iron and Steel Institute, Mr. Eugène Schneider said that it behoved the French to cast up the account of their resources in hydraulic power, so as to reserve for metallurgical purposes the greatest possible part of their coal production. Those resources might even now be easily appropriated for the traction of trains and tram-cars, lighting purposes, and the distribution of power over extensive zones, since a 60,000-volt pressure was in use, and one of 120,000 volts would be so very soon. Whereas the waterfalls now utilised yielded only from 700,000 to 800,000 H.P., future plants should allow a yield, at low water, of a minimum of 4,500,000 H.P. And as 1,000 hydraulic H.P. economised per year 10,000 tons of coal, in round numbers, the saving to expect from those plants would rise to 30 million tons, a figure approximating to their total coal extraction before the war.

Hydro-electric power had the defect of being transmitted by very long lines exposed to many risks. It would, therefore, be well to provide very powerful thermal generating sets, ready for running at a moment's notice, and capable of carrying on the work in the chief departments, pending the time when the thermal emergency stations had brought up to a maximum figure their normal reduced power.

That part would devolve upon groups worked by Diesel motors of 2,000, 4,000, and even 6,000 H.P., the price of oil fuel being in that case a negligible matter. They were studying in France such motors, and their realisation seemed assured.

The electric blast furnace was not yet widely used in industry, but the development of electric furnaces destined to the production and refining of steel was certainly assured, especially in works using hydro-electric current as motive power. It was likely that various combinations of the electric furnace with the Thomas converter or basic open-hearth steel would in future be the characteristic feature of that special iron metallurgy which was the necessary consequence of a dual source of heat. It would be the topography of the region, or, more exactly, the position of the works on the "electric map" of France, that would determine the proportionate demand to be made from either of the two sources.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Hackney Council's Establishment and General Purposes Committee has reported making certain recommendations respecting a communication received from MR. L. L. ROBINSON, the borough electrical engineer, regarding his salary. It states that it cannot recommend the Council to agree to the suggestion of the borough electrical engineer that he should be paid a minimum fixed annual salary of £850, and £50 for each 1 per cent. gross profit earned on the capital expenditure of the undertaking, as such a proposition embraces in principle the question of a bonus scheme which has not yet been adopted by the Council, and which, if subsequently decided on, should be dealt with as a whole, and not by means of individual applications. It recommends that the salary of the

engineer be increased as from April 1st, 1918, from £750 to £850 per annum, with increments of £50 per annum on each succeeding April 1st, to a maximum of £1,000 per annum, and that the amount of such annual salary be inclusive of any amount given as "war bonus," "war wage," or other grant now made, or which may subsequently be made, under any award or order or resolution of the Council.

Mr. F. Woods, station superintendent at the Rawtenstall Corporation electricity works, has been appointed, from 72 candidates, to the position of resident engineer to the Woking Electric Supply Co. He has been at Rawtenstall for three and-a-half years, before which he was at Prestwich with the Lancashire Power Co.

Mr. E. F. Joyce, resident engineer and works manager at the power station of the Woking Electric Supply Co., Ltd., is severing his connection with the company. He has recently been ill with rheumatic fever.

The *Morning Post* states that Lord Rhondda has asked the Leeds Corporation to release Mr. J. B. Hamilton, tramways manager, in order that he may take charge of a new department, to be called the General Storage and Inland Transport Department, which will co-ordinate the work of all existing branches of the Ministry of Food at present dealing with these questions. The Tramways Committee has complied with the request.

The Glasgow Tramways Committee propose the following increases to the salaries of the principal officials (the figures showing the present salaries and the recommended increases:—Mr. J. Dalrymple, general manager, £1,300—£200; Mr. L. Mackinnon, traffic superintendent, £700—£50; Mr. J. Ferguson, chief engineer, £700—£50; Mr. J. N. Wilson, secretary and treasurer, £525—£75; Mr. J. Grierson, civil engineer, £320—£20; Mr. G. B. Masterton, chief draughtsman, £310—£20; Mr. D. I. Liddell, outdoor traffic superintendent, £340—£20; Mr. F. W. Christall, claims superintendent, £380—£20.

The Bridlington Town Council has increased the salary of Mr. F. Ffrench, deputy electrical engineer, from £160 to £185 per annum.

Mr. P. T. Kimmins, the engineer to the Lynton and Lynmouth Electric Light Co., Ltd., has been co-opted by the Lynton Urban District Council as a Member of that Council.

General.—Prof. Sir James Dewar, F.R.S., has been awarded the Medal of the Society of Chemical Industry in recognition of conspicuous services rendered to the chemical industry by his research work in both pure and applied science.

The *Commonwealth Engineer* states that Mr. H. Percy Moss has been appointed electrical engineer to the Commonwealth Works and Railways Department. Mr. Moss is at present in Brisbane in connection with the acetate of lime plant being installed for the Defence Department.

The same contemporary records that Mr. H. J. Spencer, formerly of the Tasmanian Hyrdro-electric Department, has received an appointment with the Commonwealth Department of Works and Railways.

In recognition of his long public services, and as Mayor for two years and Deputy-Mayor for four, Alderman G. Weeks, of Weeks and Sons, electrical engineers, of Bromley (Kent), is to be presented with his portrait in oils.

Roll of Honour.—Private W. Fawcett, of the Cheshire Regiment, who has been killed in action, was an apprentice in the electrical department at Brookfoot Dye Works, Brighouse.

Private S. R. Ward, Machine Gun Corps, who is a prisoner of war in Germany, was on the clerical staff of Messrs. Dick, Kerr and Co., of Preston.

Private W. Boyd, South Lancashire Regiment, killed in action, was with the St. Helens Cable and Rubber Co., Ltd., Warrington.

Private T. Ellams, South Lancashire Regiment, killed in action, was with the B.I. and Helsby Cables, Ltd., Prescot.

Lance-Corporal A. Eastwood, Manchester Regiment, killed in action, was employed by the British Westinghouse Co., Ltd., Trafford Park.

Signaller H. A. V. Pease, London Regiment, killed in action, was prior to the war with Dick, Kerr & Co., Ltd., London.

The Military Medal for courage and initiative under hostile shell fire has been awarded to Rifleman C. R. Johnson, K.R.R., who enlisted from Siemens Bros. Dynamo Works, Stafford.

Wireless Operator Douglas M. Harris, of H.M. drifter *Floandi*, has been killed by a piece of shell whilst writing in the signal log of the ship in the Adriatic Sea.

Private J. Dean, Northumberland Fusiliers, who has died of wounds, was with Messrs. Taylor, Tunnicliffe & Co., Hanley.

Private Watson Bell, Liverpool Regiment, who has died of wounds, was an electrical engineer. He served his apprenticeship at Whitehaven with Messrs. Ramsay, and enlisted whilst engaged at Liverpool.

Quartermaster-Sergeant Harold Kerr, R.E., who enlisted from the staff of Joseph Walker & Sons, electricians, Whitehaven, has been killed in action.

E. H. Beesley, first-class air mechanic, R.N.A.S., and eldest son of Mr. Edward Beesley, electrical engineer, of Caledonian Road, N., for whom he was manager, has been awarded the D.S.M. for gallantry in connection with a bombing plane in flames.

Private W. Bunnage, Wilts. Regiment, formerly in the general office of the India-Rubber Co., Silvertown, is a prisoner of war. Gunner T. Ross, R.F.A., late of the cable department of the same company, died of wounds on May 1st.

Major Angus Macpherson, Machine Gun Corps, who prior to the outbreak of war was on the staff of the Glasgow Corporation tramways, has been awarded the Military Cross. Major Macpherson is 27 years of age, and has risen from a private in the original Expeditionary Force to his present rank. He has been wounded three times, received mention in dispatches on four occasions, and has been awarded the D.C.M.

Captain and Adjutant H. Smith, formerly on the staff of the traffic department of the Leeds Corporation Tramways, who was recently killed in action, has been awarded a bar to the Military Cross he already held.

Obituary.—Mr. J. B. Richards, assistant electrical engineer of the Postmaster-General's Department in South Australia, passed away suddenly in December last. The *Commonwealth Engineer* states that his connection with the Department extended over 37 years. During various periods he held the positions of postmaster, telegraph line overseer, controller of stores, inspector of telegraph lines, and assistant electrical engineer.

NEW COMPANIES REGISTERED.

British Engineering Standards Association (word "limited" omitted from title by licence of the Board of Trade) (150,504).—Registered May 23rd as a company limited by guarantee (not formed for purpose of profit), with an unlimited number of members, each liable for £1 in the event of winding up, to co-ordinate the efforts of producers and users for improvement and standardisation of engineering materials, for this purpose to take over work which has been carried on since 1901 by the Engineering Standards Committee, to register in the name of the Association the mark which was originally registered for the said Committee in 1903, to prove and affix, or license the affixing of such mark or other proof, letter, or device to certain engineering materials, &c. The first Main Committee is to consist of such of the following as consent to act, viz.:—Sir John Wolfe Barry, K.C.B. (chairman), Sir Maurice Fitzmaurice, C.M.G. (vice-chairman), Sir Douglas Fox, Sir Wm. Matthews, K.C.M.G., H. Elliott-Cooper, A. Ross, and Dr. C. Unwin (nominated by the Institution of Civil Engineers); H. V. Ivatt, N. Longridge, and Dr. W. H. Maw (nominated by the Institution of Mechanical Engineers); G. Ainsworth, Dr. A. Cooper, and I. Williams (nominated by the Iron and Steel Institute); Sir Archibald Denny, Sir W. E. Smith, C.B., and Sir Thos. Bell, K.B.E. (nominated by the Institution of Naval Architects); Col. R. E. B. Crompton, C.B., Sir J. Snell, and C. P. Sparks (nominated by the Institution of Electrical Engineers); F. C. Gilbertson and F. R. Davenport (co-opted by the nominated members to represent the Federation of British Industries); the Hon. Sir Chas. Parsons, K.C.B., Sir Richard Glazebrook, C.B., and Sir Robert Hadfield, Bart. (co-opted by the nominated members). Hon. Secretary: J. H. T. Tudsbery, D.Sc. (Another clause says: The first secretary of the Main Committee and of the Association shall be C. le Maistre, Esq., A.M.Inst.C.E., M.I.E.E.) Every member is to have one vote. Solicitors: Hargrove & Co., 16, Victoria Street, S.W.

Magneto and Spare Part Co., Ltd. (150,486).—Private company. Registered May 21st. Capital, £1,000 in £1 shares. Objects as indicated by the title. The subscribers (each with one share) are:—G. Malham, Rothesay House, Beaufort Road, Edgbaston, Birmingham, engineer; S. H. Parrott, 227, Broad Street, Birmingham, magneto expert. The first directors are: G. Malham and S. H. Parrott. Registered office: 227, Broad Street, Birmingham.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Crompton & Co., Ltd.—Particulars of £150,000 debentures, created March 28th, 1918, and secured by trust deed dated May 1st, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: Freehold and leasehold property, patents, and the company's undertaking and property, present and future, including uncalled capital. Trustees: I. Bevan and the Hon. Sir Charles A. Parsons, K.C.B. (Some of the debentures were issued in exchange for previously existing debentures.)

E. S. Co., Ltd.—Particulars of £6,000 first mortgage debentures created May 10th, 1918 (including £2,000 previously issued) have been filed, the amount of the present issue being £4,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. Payment of £2,000 debentures issued in 1915 has been postponed from 1922 to 1923, and the interest raised from 5 to 6 per cent.

Magnesium Metal Co., Ltd.—Mortgage debenture for £5,000, dated May 1st, 1918, charged on the company's undertaking and property, present and future, including uncalled capital (subject to charge securing £10,000 advanced by Vickers, Ltd.). Holders: Johnson, Matthey and Co., 78, Hatton Garden, E.C.

Reform Lighting Corporation, Ltd.—Memorandum of satisfaction to the extent of £1,850 on May 10th, 1918, of debenture dated March 26th, 1913, securing £2,750, has been filed.

Kingolite Co., Ltd.—Issue on May 1st, 1918, of £400 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Urban Electric Supply Co., Ltd.

Mr. P. D. Tuckett, presiding at the annual meeting on May 8th, said that they were asking sanction for a further increase in borrowing powers to enable them to take advantage of the loan which the Government was prepared to make. The profits for the year were larger by £2,750. The net balance was £950 better than in the previous year. It was unsatisfactory to leave the preference dividend one year in arrear, but it was as satisfactory as they could expect under existing conditions. They must conserve their somewhat slender cash resources. They had connected an additional 3,016 kw. during the year—rather less than their record connection of the previous year; 92 per cent. of the new connections were for power and heating. The output for the year increased by nearly 2¼ million

units; coal cost £7,000 more owing to an average increase of 2s. per ton, and much of it was of inferior quality. Wages and salaries increased by nearly £5,000. The progress made by the Twickenham and Cornwall undertakings was particularly gratifying, the latter having increased its profits by over £6,000, and the former by over £4,500, but instead of paying larger dividends these companies had substantially strengthened their reserves. The conditions of operating were abnormal, and the outlook was very disquieting in consequence of the various awards and the restrictive regulations. No one could forecast the extent or outcome of these developments, but as far as possible they were taking steps to minimise them. They had applied to the Board of Trade, where they were in a position to do so, requesting them to sanction increased maximum rates. But for the war they would now have been paying an ordinary dividend, or would at least have been within sight of its early payment. The new agreement with Edmundsons followed the lines of the previous agreement, except that the annual payment for management and administration was increased from £2,000 to £3,000. The output was now over 31 million units, and the revenue close upon a quarter of a million, and the fact that the business consisted of a number of small undertakings scattered all over the country involved a great deal more detail and supervision than would be the case if it were concentrated in a single undertaking. Edmundsons' association with the company was an undoubted source of strength, and without the financial assistance which they had afforded them it would have been impossible for them to have made the progress that they had made.

Anglo-Portuguese Telephone Co., Ltd.

The report for 1917 submitted to the annual meeting on May 22nd showed a profit of £25,617, against £31,599, and after paying income-tax, debenture interest, and sinking fund, putting £10,000 to renewals, 6 per cent. dividend is to be paid for the year, carrying forward £7,093. The profit was adversely affected by a further fall in the exchange value of the Portuguese currency, the actual loss on remittances amounting approximately to £22,000, an increase of £6,000. Mr. HERBERT ALLEN, who presided at the meeting, said that owing to their inability to obtain the necessary equipment either from this country or from the U.S.A., they had installed fewer new subscribers than for many years. There were hundreds of new customers waiting. For 34¼ million calls handled, the cost worked out at about ¼d. per message, average. They had had a strike of workmen in Portugal, as they were not prepared to concede a 50 per cent. advance for which the men asked. As usual, the Government intervened, and they had to make substantial concessions, but they were permitted to increase their tariff by 15 per cent. on condition that the Government took the difference if that increase more than sufficed to meet the increased wages cost. The continued rise in the rate of exchange had hit them hardest of all. They had applied for authority to further advance their tariff to meet the increased cost of working. There was scope for endless capital expenditure with, under reasonable conditions, a prospect of a fair return, but unless they could maintain their dividend it would be impossible to raise new capital for their ever-growing business. The commercial life of Portugal was looking more settled, and this and other influences might have a steadying effect on the exchange.

London and Suburban Traction Co., Ltd.

The report for 1917 records a substantial reduction in the return upon the company's investments. The net revenues of the tramway and omnibus companies have in nearly every case been adversely affected by the continuance of the war, increase in tramway receipts as a whole being more than balanced by the increased expenses of operation due to the further rise in the cost of labour and all materials, while the shortage of petrol and increased working charges have resulted in a large decrease in the net receipts of the omnibus undertakings. The revenue, consisting almost entirely of dividends and interest receivable from the subsidiary companies, amounted to £81,519, a reduction of £39,067 as against 1916. After paying debenture and loan charges, 2½ per cent for the year is paid on the preference shares, and £3,635 is carried forward. The report refers to the measures taken for reorganising the capital of the London United Tramways, Ltd., subject to a Bill passing. Under the terms of the scheme, funds will be forthcoming for reconstruction of permanent way and renewal of rolling stock and other equipment.

Electric Construction Co., Ltd.

The annual meeting, on Wednesday, was presided over by Mr. P. E. BEACHCROFT, who said that when presiding last year he thought the company had reached high-water mark under existing conditions, but he was pleased to say that, notwithstanding the difficulties which were foreseen and encountered, they had again considerably increased the turnover, and showed a substantial increase in net profit. The gross profit for 1917-18 amounted to £112,600, as against £103,000 in 1916-17, an increase of £9,600, and the net profit had increased by £15,300 —from £51,500 to £66,800. After referring to the disposal of the profit as in the report, the chairman said that they had continued their policy of purchasing the company's debentures when a favourable opportunity offered, and during the past year they procured £2,310, the discount thereon, amounting to £674, was added to general reserve fund as usual. That fund at March 31st amounted to £63,174, and with the contribution out of profits now recommended would stand at £72,500. This was invested to a very large extent in Government and trustee securities and in short-dated debentures, all of which would be available for the purposes of the company as and when required. In addition, they had ample working capital, and altogether the financial position of the company was as strong as they could wish. He would particularly emphasise the fact that they had year by year provided considerable sums for new plant and tools, which should, after this disastrous war was over and done with, place them in such a strong position as to costs of production as would enable them to meet any competition which might arise. They would expect him to say something, as usual, regarding the prospects and general condition of affairs. Well, he was a great believer in the precept, "Do not prophesy unless you know," but he was well within the mark when he said that the immediate prospects were quite encouraging, as they had commenced the new financial year under auspices more promising than heretofore; and, assuming that the supply of materials was maintained in a reasonable manner, the results should prove satisfactory. The irregular supply of materials had been one of their greatest difficulties, and they would realise its effects on the prompt delivery of their machines, and on the cost of production. The relation of Capital and Labour after the war had been engaging the attention of various commissions and committees, and many suggestions had been made of an interesting and far-reaching character. To enable the country to recover from the financial strain of the war a larger output per head would be essential, and if, in exchange for the removal of restrictions relating to output, workpeople secured a larger share of the proceeds of Capital and Labour, the result would be for the general good. They were members of the Federation of British Industries, which was taking an active part in these matters, and any measures framed to this end would have their sympathy and support. Meantime, it afforded him much pleasure to say that the relations with their own workpeople continued to be of the most harmonious character. Although Sunday labour was discontinued by the Ministry of Munitions of War in the beginning of their last financial year, their turnover, with only a comparatively small addition to their tool equipment, showed an increase, and this had been the experience of others. There could, therefore, be no question that this was a wise step on the part of the Ministry, as the strain of continuous employment was more than could be borne reasonably. Even to maintain their turnover very special efforts were necessary on the part of both the staff and workpeople, and they tendered them their best thanks from the manager downwards. Their attention no doubt was directed a short time ago to a somewhat phenomenal rise in the market value of the shares. There had been many rumours prevailing of amalgamations, or reciprocal trading relationships between companies having kindred businesses, and he could only suppose that there was some such rumour with regard to this company. No arrangement of this kind, however, had been under consideration. The whole attention of the board and management was devoted to the advancement of the company's interests without regard to the fluctuations of the market value of the shares. Many of them had held the bulk of their shares from the early years, and had endured with patience and confidence the days of stress and troubles, but they were now reaping a well-earned return—due to the strenuous labour on the part of their active management during those times, as well as the present.

Mr. JAMES GRAY seconded the motion, and the report was adopted.

General Electric Co. (U.S.A.)

The report for 1917 shows that the value of orders received for the past five years has been as follows:—

	Electrical and mechanical.	War munitions.	Total.
1917	$246,778,491	—	$246,778,491
1916	167,169,058	$2,416,000	169,585,058
1915	98,885,891	33,980,000	132,865,891
1914	83,748,521	—	83,748,521
1913	111,819,142	—	111,819,142

A substantial portion of the large increase for the past year consisted of orders for ship propulsion and other apparatus placed by and for the United States Government, but the increase extended to nearly every line of the company's product. Higher prices, due to increased cost of materials and labour, were also a factor in the larger total value of orders. The amount of sales billed was $196,926,318, an increase of $62,684,028, or 47 per cent. over the previous year. The net result was a profit of $29,004,540, plus income from other sources $4,512,290, less interest on debentures $571,645, interest and discount on notes payable $541,357, leaving available for excess profits tax and dividends $32,403,828. Excess profits tax estimated $5,500,000, dividends $11,165,882, leaving a surplus for the year of $15,737,946. The large increase in sales during the last two years has made it necessary to add to manufacturing facilities to an extent entirely without precedent. During the year $22,320,895 was expended for land, buildings and other structures, tools, machinery and smaller equipment and fixtures. In view of the prevailing high prices of all material and other unusual conditions, the sum of $13,287,249 has been charged against income and general reserve as depreciation and additional plant reserves, resulting in a net increase, in the book value of plant and

equipment, of $9,033,646. In addition to the $22,320,895.06 expended last year, it has been necessary to authorise expenditures for further plant extensions amounting to $13,000,000, which will be completed during 1918. The total factory floor space in recent years has been as follows:—

1915	14,830,000 sq. ft.
1916	15,300,000 sq. ft.
1917	17,578,000 sq. ft.

At a special meeting of the stockholders held in January, 1918, it was voted to increase the authorised capital stock of the company from $105,000,000 to $125,000,000. The new stock has since been offered to the stockholders, and all subscribed. The dividends declared by the directors for the year 1917 were, therefore:—Cash dividends, 8 per cent., $8,120,648; "Red Cross" dividend, 1 per cent. cash, $1,015,078; initial stock dividend, at 4 per cent. per annum, $2,030,156; total, $11,165,882.

German Companies.

The directors of the *Welter, Elektrizitats und Hebezeug Werke A.G. of Cologne-Zollstock* recommend a dividend at the rate of 8 per cent. for 1917, as contrasted with 6 per cent. in the previous year.

The Korting und Mathiesen A.G., of Leutsch, Leipsig (arc lamps and electrical apparatus), proposes to raise the rate of distribution from 8 per cent. in 1916 to 16 per cent. for last year.

The Dr. Paul Meyer A.G., of Berlin, reports an allocation of £8,000 to depreciation in 1917, this comparing with £13,000 in the previous 12 months. It is intended to pay a dividend at the rate of 10 per cent. out of net profits of £24,000, as contrasted with 7½ per cent. and £19,000 respectively in the preceding year.

The accounts of the *Land und Seekabel Werke A.G., of Cologne-Nippes*, show the appropriation of £19,000 for depreciation in 1917, as compared with £7,000 in the previous year. The net profits were £37,000, as in 1916, and the dividend is again at the rate of 12 per cent. on the paid-up capital of £262,000.

The Felten & Guilleaume Carlswerk A.G., of Cologne-Mulheim, after setting aside £243,000 for depreciation in 1917, as against £156,000 in the preceding year, reports net profits of £519,000 and £418,000 in the two years respectively. It is proposed to increase the rate of distribution from the 12 per cent. paid for 1916 to 15 per cent. for the past year.

The Elektrizitats Lieferungs Gesellschaft, of Berlin, which owns a number of supply works and is interested in various others, and also in tramways, states that as a consequence of a friendly understanding with most consumers in regard to price increases, the working results in 1917 were not affected by the greater cost of raw materials and the limitation in the consumption. After placing £52,000 to depreciation, as contrasted with £27,000 in 1916, the accounts indicate net profits of £163,000, being the same as in the preceding year. The dividend is at the rate of 10 per cent. on the ordinary share capital of £1,500,000, as in each of the three previous years.

The Hamburg Hochbahn A.G., of Hamburg, records an increase in the gross revenue in 1917, and net profits of £47,000, as against £32,000 in 1916. The directors recommend a dividend at the rate of 5½ per cent., as compared with 4 per cent. in the preceding year. At the instance of the Hamburg State this elevated railway company is to be converted into a joint economic undertaking, in which the State will have a preponderating influence in the carrying out of the city high-speed railway, the tramway and motor omnibus traffic, as well as of shipping on the Alster.

The French Thomson-Houston Co.

The report of the directors of the Compagnie Francaise Thomson-Houston states that the activity of all departments was maintained in 1917, and the total value of the turnover was greater than in any preceding year. At the same time, the production, reckoned according to the number of machines and in kilowatts, was higher than in peace time, thus indicating that the normal manufactures continued to develop, notwithstanding the company's output of war material and the difficulties experienced in obtaining supplies of raw materials and of labour. The extensions and increases in plant and equipment were continued, and the erection of the new shops at the telephone factory was in an advanced stage. All the sites owned by the company were being utilised to the fullest extent, and other sites had to be rented for the execution of war contracts. On the other hand, it was now known from a reliable source that the Lesquin works, near Lille, had been entirely dismantled and demolished by the enemy. Under these circumstances, the directors had considered it indispensable already now to procure sites which would be needed to deal with the industrial development which was foreseen in the near future, and lands had, therefore, been acquired for this purpose of a superficial area of about 75 acres, bordering on the railway and the Seine.

The turnover in the department devoted to telegraphy, telephony, and apparatus for railways exceeded by 70 per cent. that which prevailed in 1916, the development having been limited solely by the productive capacity. The directors were increasingly convinced that in this special branch, both in regard to public and private telephony, they had a large sphere of activity, and that the business would be considerably increased when further productive means were available. The sale of batteries was becoming an important branch, and the small "Mazda" battery was as successful with customers as the lamp of the same name. The construction of large batteries for the postal service had been developed, and there was about to be added the production of types of batteries for water or electrolyte filling of greater duration. Discussing the satisfactory course of the lamp department, the report states that the present relatively high prices had caused foreign lamps to be imported, and schemes to be promoted for the erection of new lamp factories, which, however, were not necessary to meet the requirements of the market. Several months ago the first turbo set of 6,000 KW. for the Compagnie Générale de Distribution d'Energie was set in operation, and, owing to the expansion of the industrial needs in that company's area, it had been decided to transfer to the station a second set of the same power from a provincial station, whilst a third set of 10,000 KW., which was originally intended for the Baku Co., was in course of erection. The first sections of the plant for the Usine d'Eget of the Compagnie du Midi, comprising seven alternators of 4,375 KW., transformers from 120,000 volts, switchboards, &c., had already been forwarded from America, and the remainder was being completed. After referring to new orders on hand, including contracts for turbo-alternators of 6,000 KW., transformers of 5,000 KW., frequency transformers, tractors or petrol-electric locomotives, &c., the report mentions that the sale of standard plant continues to expand, particularly in regard to machines for generating sets, high-speed motors for pumps and ventilators, lifting plant, &c. In conclusion, reference is made in detail to the supply works and tramways in which the company holds a financial interest.

The accounts show gross profit for 1917 amounting to £455,000, as compared with £423,000 in the preceding year. After defraying general expenses, financial charges, and placing £78,000 to depreciation, the net profits are returned at £200,000, as against £173,000 in the previous year. The dividend is at the rate of 8 per cent. on the ordinary share capital of £2,400,000, this contrasting with 7 per cent. in 1916.

Shanghai Electric Construction Co., Ltd.—Supplementing our note of last week, in which we announced the dividends for the year, we observe from the report now to hand that the profit was £67,504 against £48,123 for 1916. The loss by exchange on subsidiary coinage in 1917 was £35,478, which is equal to 11.09 per cent. on the capital of the company. The ratio of depreciation to gross takings was sensibly lower during the past year than for several years past. The traffics and net receipts for the current year continue to be satisfactory. An arrangement made with the Municipal Council to commute the company's liability for road maintenance by payment of an annual sum of Tls. 16,500, subject to revision every ten years, was confirmed at the annual meeting of ratepayers, held in March last. The construction of the new central offices in Shanghai is proceeding satisfactorily, and it is expected that the building will be ready for occupation this year.

West India and Panama Telegraph Co., Ltd.—The amount to credit of revenue for 1917 is £113,644, and the expenses have been £69,344, leaving £44,300, plus £3,205 from interest on investments, and £2,888 brought forward. From this sum there has been deducted £6,065, the cost of extending the date of maturity of the debentures, leaving £44,328. The directors have placed to general reserve £10,000, and they propose a final dividend on ordinary shares of 6d. per share, and a bonus of 3d. per share, both free of income-tax, carrying forward £5,268. The traffic receipts show an increase over those for 1916. The receipts for the current year so far show a slight falling off as compared with those for 1917. It is not possible under present circumstances to set aside a special reserve to meet depreciation on investments in respect of reserve funds.

Brush Electrical Engineering Co., Ltd.—Dividend of 6 per cent. on the ordinary stock for each of the years 1916 and 1917.

Companies to be Struck Off.—The following companies are to be struck off the register within three months, unless cause is shown to the contrary:—

Argentine Electrolytic Syndicate, Ltd.
Armour Plate (Cowper-Coles Patents), Ltd.
Bachelet Levitated Railway, Ltd.
Colonial Rail & Tramway Syndicate, Ltd.
Crowther & Co.'s Electrical Industries, Ltd.
Davis Electrical Co., Ltd.
Electromobile Co., Ltd.,
Ideal Publicity Co., Ltd.
J. G. Childs & Co., Ltd.
Measures Bros., Ltd. (1899).
Mechanical Traction Syndicate, Ltd
Miners' Lamp Electric Lighting Co., Ltd.
Rossendale Belting Co., Ltd. (1908).
Salt Lake and Ogden Gas & Electric Light Co., Ltd.
Spiral Regulating Dynamo Co., Ltd.

Simplex Conduits, Ltd.—According to a financial contemporary, the accounts for 1917 show a net profit of £21,949 (against £8,639); £7,372 was brought forward, making £29,321. The directors announce a dividend of 10 per cent. and a bonus of 10 per cent., both free of tax, the same as last year; £2,000 to reserve (making £30,000), leaving £17,071 to be carried forward, subject to excess profits duty.

South Wales Electrical Power Distribution Co.—The report states that the business shows an increase during 1917, the units sold amounting to 36,959,049, an increase of 6,900,588 units, or nearly 23 per cent. Negotiations have been completed for a further substantial increase of output. After payment of all expenses the credit balance was £24,748. Deducting interest on prior lien debenture stock and the original debenture stock, and making provision for depreciation of the new plant, there is a balance of £64 to carry forward.

British Electric Traction Co., Ltd.—Dividend of 6 per cent. on the cum. participating preference stock, and one of 3 per cent. on the ordinary. £20,000 to reserve.

Mirrlees, Bickerton & Day, Ltd.—Dividend of 10 per cent., free of tax, on the ordinary shares, £5,000 to reserve, and £2,120 carried forward.

Anderston Foundry Co., Ltd.—Final dividend 17s. 6d. per share (making 22s.), less tax. £5,000 to reserve, carrying forward £13,225.

Provincial Tramways Co., Ltd.—Interim dividend 8d. per share, less tax, on the ordinary shares.

STOCKS AND SHARES.

TUESDAY EVENING.

NOTWITHSTANDING the commencement of the new German offensive, business in the Stock Exchange shows little contraction in volume. The principal market so far as activity is concerned continues to be that in which industrials are negotiated, and amongst these the shares of the manufacturing issues, more particularly electrical and cable, stand out with especial strength. The tone throughout the House as a whole is firm, the rise in the War Loan encouraging appreciation in the debenture stocks and preference shares of the best commercial undertakings; at the same time affording eloquent evidence of the calmness with which the public throughout the country regard the issue of the German advance.

Most of the shares in the cable market are better. Marked interest is once more directed to such companies as those which are in the habit of declaring their dividends free of income-tax. Advances have taken place in Eastern Extensions, Eastern and Western Telegraphs, Globe Ordinary, and various others. The jobbers lament that if only they could induce more sellers to realise holdings, there would be a big business doing, whereas the present condition is such that prices mount steadily, and yet no stock comes in to supply the people who are willing to pay the higher quotations, without, however, being able to get the stock. Henley's are noticeably strong, and a peculiarity of their market is the way in which small lots of shares are constantly being inquired for. The inference is that members of the staff are eager to place their savings in their company's shares, in addition to which it may be that in these, as in other similar cases, the shares are bought for the purpose of the companies' employés funds. General Electrics are another hard market; the ordinary are wanted at 20½ or better.

The strength of other electrical manufacturing shares is thoroughly well maintained. Edisons, Electric Constructions, and British Aluminium are amongst those for which there is a constant demand, and British Westinghouse preference are steadily rallying after their slump, the price having improved to 46s. upwards. Other industrials show improvement in the majority of cases. The only section of the industrial market which is weak is that devoted to rubber shares, where the dividend outlook, combined with the unfortunate position into which the industry has fallen by reason of transport difficulties, &c., are causing people to realise their shares. The root of the trouble lies probably in the fact that, with Germany no longer able to get the rubber, the mid-East companies are producing too much, and the supply has overshot the demand.

The railway market is another of those in which recovery in share values is noticeable. Undergrounds are beginning to participate in the greater firmness shown during the past fortnight. Districts have recovered to 14½, and, although Metropolitan Consolidated has not moved, the tendency of the market in the stock is better. Underground Electric Income bonds lost part of their recent rise, but the company's shares, and those of the London Electric, are very steady.

The market for home electricity shares is steady. They continue to attract little interest, and there are few transactions taking place in them from day to day. The market, however, is firm, no shares coming in.

British Electric Traction has declared a dividend at the rate of 3 per cent. on the ordinary stock, the same as last year, placing about £20,000 to reserve. The price of the ordinary and 6 per cent. participating preference stocks now stand at 31½ and 73½ respectively. The last business recorded in the 5 per cent. debentures was at 77¼, while the 4½ per cent. second debenture changed hands at 63½ a fortnight ago.

The strength of British Columbia stocks is well maintained, and the preferred has risen another point to 42½. Anglo-Argentine Tramways 5 per cent. debenture stock continues to improve, and is now 65. Mexicans show no quotable change. There are rumours of rupture between Mexico and Cuba, but these have not affected the railway stocks of the country, which are still on the up-grade, though the Utilities have hardly moved. Mexico Tramways Common shares stand at 24½. Para Electric Railway Ordinary have improved to £4. Something of a feature during the past few days has been marked activity in Pernambuco Power Ordinary shares, which have risen from their recent lowest price of 6s. to the present price of 8s. 6d., the 7 per cent. preference going to 14s., and the 5 per cent. debentures to 67. No dividends are at present paid on the first two classes. Potteries Electric Ordinary changed hands this week at 7s. 4½d., and the 5 per cent. preference were last done at 12s. 6d. A transaction took place in the 4 per cent. debenture stock of the London United Tramways at 35½ early in this week.

The British Insulated & Helsby Cables, Ltd., held a meeting at Liverpool on Monday, when a resolution was unanimously passed enabling the board to capitalise undivided profits and to distribute them among shareholders in the form of ordinary shares. The price of the latter at 75s. has gained ½ in consequence. Babcock & Wilcox advanced 1/16, and the armament group keeps very hard.

SHARE LIST OF ELECTRICAL COMPANIES

HOME ELECTRICITY COMPANIES.

	Dividend 1916.	Dividend 1917.	Price May 28, 1918.	Rise or fall this week.	Yield p.c.
Brompton Ordinary	9	10	69	—	£7 8 0
Charing Cross Ordinary	5	4	8½	—	6 3 1
do. do. 4½ Pref.	4½	4½	3½	—	6 18 6
Chelsea	3	5	3	—	*8 6 8
City of London	8	8	12	—	6 10 8
do. do. 6 per cent. Pref.	6	6	9½	—	6 0 4
County of London	7	7	10½	—	6 13 4
do. 6 per cent. Pref.	6	6	9½	—	6 0 4
Kensington Ordinary	6	7	8½	—	6 10 3
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	4	5	3½	—	7 18 10
Metropolitan	3	4	3½	—	6 3 1
do. 4½ per cent. Pref.	4½	4½	3½	—	6 13 4
St. James' and Pall Mall	5	9	7	—	6 6 4
South London	5	5	2⅛	—	7 2 4
South Metropolitan Pref.	7	7	21/-	—	6 13 4
Westminster Ordinary	7	9	6½	—	7 3 10

TELEGRAPHS AND TELEPHONES.

	Dividend 1915.	Dividend 1916.			
Anglo-Am. Tel. Pref.	6	6	94	—	6 7 8
do. Def.	23/8	1½	22	—	6 14 10
Chile Telephone	8	8	77	—	5 3 3
Cuba Sub. Ord.	5	7	94	—	*7 7 4
Eastern Extension	8	8	103	+ ½	*5 4 0
Eastern Tel. Ord.	8	8	165½	+1	*5 3 0
Globe Tel. and T. Ord.	7	7	14½	+ ½	*4 15 9
do. Pref.	6	6	10	—	6 0 0
Great Northern Tel.	22	24	37	+10/-	6 6 4
Indo-European	13	13	48½	—	6 14 0
Marconi	10	15	8½	—	4 17 10
Oriental Telephone Ord.	10	10	4 7/16	— 7/16	2 7 9
United R. Plate Tel.	8	8	7	—	*5 15 4
West India and Pan.	6d.	6d.	1½	—	*2 6 8
Western Telegraph	7	8	15½	+ ½	*5 2 5

HOME RAILS.

Central London, Ord. Assented	4	4	6½	—	6 8 0
Metropolitan	1	1	20½	—	4 16 5
do. District	Nil	Nil	14½	+ ½	Nil
Underground Electric Ordinary	Nil	Nil	12	—	Nil
do. do. "A"	Nil	Nil	4/6	—	Nil
do. do. Income	6	4	16½	— ½	*5 4 7

FOREIGN TRAMS, &c.

	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	4⅞	—	6 6 4
Anglo-Arg. Trams, First Pref.	5½	5½	2½	—	—
do. 2nd Pref.	5½	—	2⅝	—	—
do. 5 Deb.	5	5	64	+1	7 13 10
Brazil Tractions	4	4	4⅜	—	—
Bombay Electric Pref.	6	6	9½	—	6 6 4
British Columbia Elec. Ry. Pfcs.	5	5	20½	—	5 5 4
do. do. Preferred	Nil	Nil	42½	+1	Nil
do. do. Deferred	Nil	Nil	34	—	Nil
do. do. Deb.	4½	4½	64	—	6 12 10
Mexico Trams 5 per cent. Bonds	Nil	Nil	37½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	30	—	Nil
Mexican Light Common	Nil	Nil	17½	—	Nil
do. Pref.	Nil	Nil	26½	—	Nil
do. 1st Bonds	Nil	Nil	38½	—	—

MANUFACTURING COMPANIES.

Babcock & Wilcox	15	15	8 7/16	+ 1/16	4 7 8
British Aluminium Ord.	7	10	14	+ 3/16	8 3 0
British Insulated Ord.	17½	20	75	—	5 6 8
British Westinghouse Pref.	7½	7½	2 7/16	+ ½	6 9 4
Callenders	20	20	17	—	8 17 8
do. 5 Pref.	5	5	4	—	6 5 0
Castner-Kellner	22	20	84½	—	5 17 4
Edison Swan, fully paid	—	—	22	—	Nil
do. do. 4 per cent. Deb.	4	4	75½	—	5 6 0
Electric Construction	7½	7½	14	—	7 12 4
Gen. Elec. Pref.	6	6	10⅝	—	5 15 8
do. Ord.	18	10	20½	—	4 18 9
Henley	25	25	20½	+ ½	6 2 0
do. 4½ Pref.	4½	4½	20	—	5 13 2
India-Rubber	10	12	18½	—	*3 5 0
Telegraph Con.	20	20	42½	+ ½	*5 13 0

* Dividends paid free of income-tax.

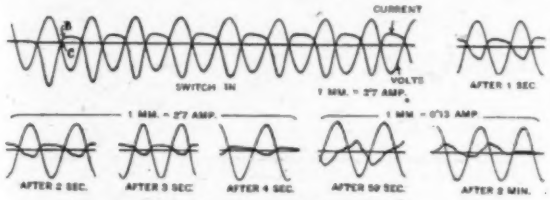
SOME TRANSIENT PHENOMENA IN ELECTRICAL SUPPLY SYSTEMS.

By Prof. E. W. MARCHANT, D.Sc., M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers.)

The study of transient phenomena in electrical supply systems has become, with the increasing size of power stations and distributing networks, a subject of growing practical importance to electrical engineers. Nearly all the phenomena described in this paper have been observed by means of the oscillograph, and a considerable portion of the work involved in its preparation has been directed to enable them to be studied under known conditions, and to make them demonstrable and obvious with machines of moderate capacity.

One of the best-known transient phenomena is that which occurs when a transformer is switched on to an A.C. supply system. When 100 periods was the standard frequency the phenomenon was usually of no great importance, since in such transformers the flux density in the core was usually kept low in order to avoid overheating; with 50-period transformers also, the phenomenon does not give rise to any very dangerous rushes, but with 25-period transformers worked at flux densities well over half saturation, the current which



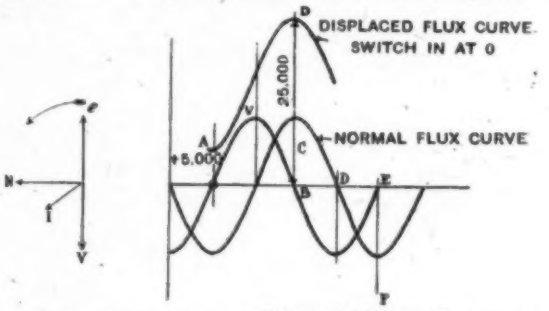
Current 90 deg. out of correct phase.

Fig. 1.

may flow when the transformer is switched in may be enormous. In fig. 1 is shown a current-rush observed on one phase of a 100-kw., 3-phase, 6,600-volt transformer of the core type, when switched on near the zero point of the pressure wave.

The rush depends not only on the point of the pressure wave at which the circuit is closed, but also on the remanent magnetism in the iron. For example, if the remanent magnetism is + 5,000 lines per square centimetre (see fig. 2) the working maximum flux density is ± 10,000, and the instant of closing circuit is O (see fig. 2), when under steady conditions the flux density should be − 10,000, there will be a flux density at the end of a half-period of 25,000 lines per square centimetre; the change in the flux density through the iron in order to provide the necessary counter E.M.F. being 20,000 (*i.e.*, from − 10,000 to + 10,000 under steady conditions), while, in addition, there is the initial remanent magnetism (O A) of 5,000. Under such circumstances the current flowing to the transformer will have to be sufficient to produce this flux density, and may be many hundred times the normal magnetising current. When the transformer is switched in at the same point of the pressure wave, but with no remanent magnetism, the current rush may also be a large one.

A number of tests were made on a bank of three 100-kw. step-down transformers switched on to the mains. One of



N = flux; *e* = counter E.M.F.; V = applied potential difference; I = current.

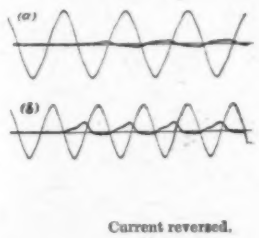
Fig. 2.—Vector Diagram.

the records has been reproduced in fig. 1. Denoting the three phases by X, Y, and Z, the pressure has been measured across phases X and Z and the current in line Y, so that the current curve is 90 deg. out of its correct phase. The maximum value of the current-rush is over 90 times the steady magnetising current shown after two minutes. In this case the switch-in occurred very near the zero point on the pressure wave, *i.e.*, at the instant at which under steady working conditions the flux density should have a positive or negative maximum. Allowing for phase displacement of the current curve the pressure is decreasing (B, fig. 2), and the flux should have been a positive maximum. Assuming, in the first instance, that there is no remanent magnetism in the core, it follows that at the end of a quarter-period, when the "steady condition flux" would have been zero, the flux will now be − N (if N is the maximum value of the flux through the core); it is necessary, therefore, that there shall be a negative current. During the first quarter-period the current will not be very large. During the second quarter-period after switching-in, the negative flux through the core must continue to increase in order to provide a counter E.M.F. in the right direction, and at the end of the half-period it will have increased to a maximum value of nearly − 2N (neglecting the effects of hysteresis and the resistance of the coils). The current required to produce this negative flux should also reach a maximum value at the same instant.

Had there actually been no remanent magnetism the current should have continued to remain negative during the third and fourth quarter-periods, but in the curves shown in fig. 1 the current reverses very soon after the maximum point on the pressure wave, so that there must have been a considerable positive remanent magnetisation of the core at the instant of switching-in, *i.e.*, conditions were not as bad as they might have been.

During the third quarter-period after switching-in, therefore, the flux changes from negative to positive, and the current required to produce it does the same, but, since the positive flux is comparatively small, the current required to produce it is small also, and the positive current during this and the fourth quarter-period is relatively small. The iron in this state being in a condition in which it has a very high permeability, it follows that a comparatively small increase in current is required to produce the necessary change of flux through the core. The curve of current is almost square, and the value of the current up to the bend represents the magnetising force necessary to reverse the direction of magnetisation of the iron, the subsequent alteration of flux being effected by a very small change in the current. The part of the curve marked C B is therefore a measure of the coercive force for the iron required to reduce the magnetism to zero. This coercive force increases during the first 10 or 12 periods, due presumably to the repeated powerful negative magnetisation of the iron.

The chief effect of the additional loss due to eddy currents will be to introduce a component into the current curve in phase with the voltage, this bringing the resultant current-wave more closely into phase with the voltage than the flux curve. This is shown in fig. 1, and the eddy-current component is clearly considerable. It is interesting to notice how slowly this remanent magnetism dies away. At the end of 50 seconds it is strong, and even after two minutes it is appreciable. This result is in accordance with the well-known fact that in order to destroy remanent magnetism it is necessary to demagnetise the iron by a magnetising force



Current reversed.

Fig. 3.

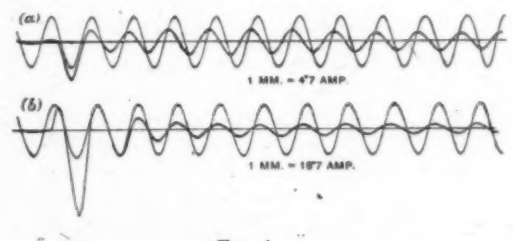
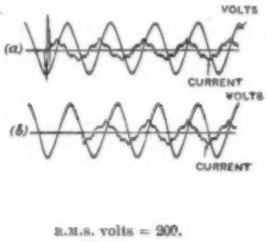


Fig. 4.



R.M.S. volts = 200.

Fig. 5.

continuously reversed and considerably stronger than that which produced the original magnetisation. With the currents used the magnetising forces are not powerful enough to effect the demagnetisation of the iron rapidly. It has sometimes been noticed after switching-in transformers that the pronounced hum which always accompanies excessive magnetisation may last for as long as half an hour. During this time the heating of the core due to eddy currents and hysteresis is considerably greater than it is under steady conditions, and under some circumstances this may give rise to trouble in operating the transformer.

The factors affecting the current-rush are: (1) the condition of magnetisation of the core at the instant of "switching in," and (2) the instant of closing the circuit. It is therefore impossible to control the "rush" unless the transformer is

switched out of circuit at a predetermined point on the pressure wave, so as to leave a definite remanent magnetism in the core, and is then switched in again at another predetermined instant.

In fig. 3 are shown curves obtained for the switching-in of two small transformers, in which the instant of closing circuit was controlled to within 1/1,000th of a second by a switch operated by a contact-maker on the alternator supplying the system. Similar results have been given by Prof. J. T. Morris for a circuit in which the connections were closed and opened in rapid succession.

Experiments were first made with a pair of 3-KW. transformers designed for a flux density of 3,000 lines per square centimetre at 100 volts and 100 periods. This transformer was connected to a 100-volt, 50-period circuit, so that the flux density in the core would be about 6,000 lines per square centimetre.

Two typical curves are shown in fig. 3 in which (*a*) the circuit is closed at the maximum point in the pressure curve, and the other (*b*) when it is closed at the zero point. In fig. 3 (*b*) the effects are the same as those already discussed, but the conditions become steady more rapidly on account

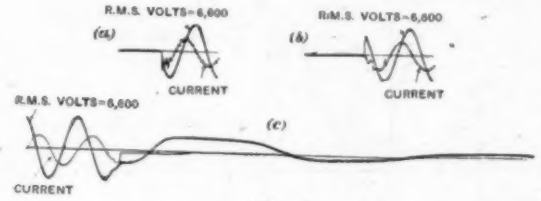


FIG. 6.

of the smaller size of the transformers. With these transformers when the circuit is closed near the maximum point of the pressure wave the rush is negligible (fig. 3, *a*)—the actual instant of the switch-in was about 0.6 of the half wave from the zero point—and the current at once reached its steady value, and did not vary appreciably during the first few seconds, the curve being quite symmetrical.

A current-rush nearly always occurs when an induction motor is switched on to a circuit. This curve, however, is somewhat different from that of the transformer, since the rotor circuit is closed so that the machine is similar to a short-circuited transformer, whereas in the case already considered the transformer secondary circuit is open. A number of induction motor-generators are in use on the Liverpool Corporation electric supply system, and some tests were made on one of 300 H.P. coupled to a continuous-current generator of 220-KW. output. The motor was three-phase, star-wound, with 6,000 volts between the lines, and taking a current at full load of 26 amperes per phase; the frequency was 50 periods, and the speed 420 R.P.M.

No attempt has been made to control the instant of closing the circuit, and in this case it will not greatly affect the rush of current. The records show that the rush is extremely large. In these tests it reached a maximum value of over 380 amperes per phase, or nearly 270 amperes R.M.S., *i.e.*, 10 times the full-load current. It is easy to see why this rush is a big one. When the machine is being run up on the continuous-current side, and before the high-tension switch on the induction motor is closed, there is no magnetisation in the stator core of the induction motor. If the machine were running absolutely synchronously the conditions would be similar to those existing when a transformer is switched on, and there might be a rush due to the same causes as those discussed above.

This rush will, however, be relatively small, since the flux density in the iron circuit of induction motors is low, and there is an air-gap in the iron circuit. Even under the most unfavourable conditions it is not comparable with that found in a stationary transformer.

It is, however, difficult to synchronise these machines exactly; ordinarily, they are switched in when they are running a little above or below synchronous speed. Consequently, there is a sudden rush of current such as would occur in a short-circuited transformer when switched on to a supply circuit on its primary side. In this case the rush on the primary induces a current through the rotor, which almost instantly pulls the rotor into step, and which soon dies down to its normal value. This current is a load current, and involves a large expenditure of power in the motor, so that the forces that come into play are very large. These forces exert very heavy stresses on the induction-motor windings, and may easily lead to a breakdown, especially with large machines. Two records are shown in fig. 4. In one of these, fig. 4 (*a*), the motor was switched in without great care being taken in synchronising it; the maximum current-rush is nearly 10 times the full-load current. In the other case great care was taken to bring the speed of the induction motor-generator to exactly its running value before the switch was closed. The initial rush is nearly the same, as far as it can be estimated from the curve, but the current dies down much more quickly to its steady value under these conditions.

In most circuits in this country long lengths of underground cable are used, which have a comparatively small inductance, and the effects observed on switching-in closely resemble what happens when a condenser is suddenly switched on to an inductive circuit.

An unloaded feeder is usually switched on by connecting it through a transformer to a number of generators. The transformer has considerable inductance due to magnetic leakage, and the generator also possesses inductance, so that the conditions existing may be represented by an inductive circuit which is suddenly connected to a condenser.

A 30-KW., 200-volt, 50-period alternator was connected to a condenser having a capacity of about 15 microfarads. In fig.

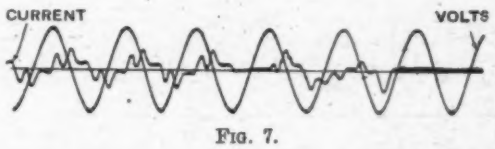


FIG. 7.

5 (*a*) there is a strong 19th harmonic. The curves of current and pressure for the two extreme cases (*i.e.*, switching-in at maximum pressure and zero pressure) are shown in fig. 5 (*a*) and (*b*). In fig. 5 (*a*) a strong current oscillation is observable with a frequency of about 800 periods per second, the maximum value of the current being nearly double that flowing under steady conditions.

The case in which the values of the capacity and inductance are such as correspond to a natural frequency higher than the working frequency is illustrated in fig. 5 (*a*); this is the only case where there is any serious danger, and, of course, the condition of high natural frequency is much the most common. The surge depends upon the instant at which the switch is closed. Theoretically, it will, in most cases, be greatest when the switch is closed at the instant of maximum potential difference. This is clearly shown experimentally in fig. 5 (*a*) and (*b*). The maximum pressure-rise possible is nearly twice the maximum or peak value of the potential difference.

In the feeder-switching experiments the length of cable used was 3¼ miles, and was designed for 6,600 volts between the three cores, with a capacity between each phase and earth of 0.27 mfd. per mile. Each core had a cross-section of 0.2 sq. in., and the outer sheathing was earthed. A switching-in curve is shown in fig. 6 (*a*). The surge is very small, and the conditions steady down after an extremely short interval.

In fig. 6 (*b*) is shown a switch-in which occurred near the instant of maximum potential difference. In this case also the surge is almost inappreciable on the record, probably due to its high frequency. The most interesting records have been obtained when the feeder is switched off. The charge on the cable does not die away continuously, but there is a low-frequency oscillation—in this case of about 12 periods per second. The instrument transformers remained connected after the cable was switched off, and the frequency observed corresponds to the natural frequency due to the instrument (volt) transformers and the cable, in series. The natural frequency of the circuit with instrument transformers only in circuit is, of course, much lower than that when the cables are switched on to the bus-bars.

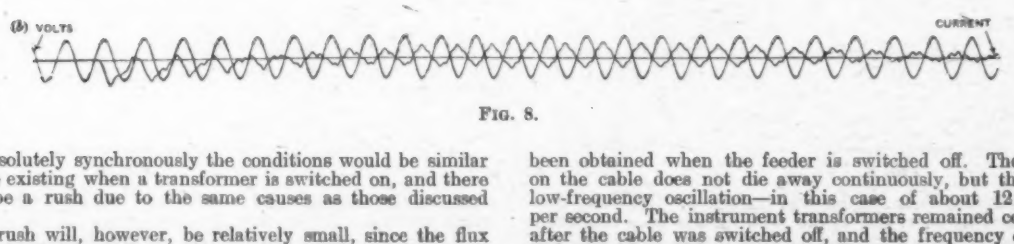


FIG. 8.

A few oscillograms have been taken of the currents which flow between turbo-alternators when a 6-pole, 1,500-KW. machine is paralleled with a 6,000-KW. machine having four poles. The pressure waves of these machines are very nearly pure sine curves as shown in fig. 7, the most remarkable feature being the irregular shape of the wave of the current.

In this curve a very strong fifth harmonic of current is

present. The record shows the switch-off, and emphasises the fact that it takes two or three periods to open a circuit with the heavy gear rquired for controlling 1,500 KW.

The current which flows when the machine is paralleled depends upon two factors, *i.e.*, the phase relationship between the E.M.F. of the incoming machine and the bus-bar pressure, and the exact relative speed of the machines at the instant of closing circuit. In fig. 8 (*a*) the switch has been closed almost exactly at the right moment, and the current-rush is very small, there being very little phase-swing. In fig. 8 (*b*) there is a considerably greater phase swing. These two curves represent probably the limits of variation which may occur under ordinary working conditions with a good switchboard attendant. In fig. 8 (*b*) it will be noticed that there is a more or less regular period of increase and decrease in current. The period of this variation in current is approximately four-fifths of a second, and represents the natural period of swing of the alternator when running in parallel with a number of other machines. The curve shows the variation in phase difference between the circulating current and the pressure of the machine. After the instant of closing circuit in fig. 8 (*b*) there is an irregular current surge which dies down rapidly, and after about seven periods there is almost exact phase opposition between current and potential difference. This current, which is a motoring current for the machine, increases to a maximum, and then dies almost completely away except for a strong fifth harmonic, which still continues to flow round the circuit. During the next 10 periods the current circulating increases steadily, but it is now a generated or load current, being nearly in phase with the potential difference. It again falls to a minimum at the end of about 20 periods from the previous minimum, and the process is repeated.

A similar test was taken for a 1,500-KW. self-synchronising rotary converter, the record from which is shown in fig. 9. In this case the period of swing is shorter, about six periods between minimum and maximum motoring currents. This, of course, is what is to be expected, since the moment of inertia of the revolving mass is very much less than in a turbo-generator of the same capacity. The decrement of the swing also is much greater, the phasing current during the second phase-swing being much less than that during the first phase-swing. This machine was fitted with copper

FIG. 9.

dampers on the poles, which greatly increase the damping of the oscillations. The maximum phase-swing current occurs at the time when the current and pressure are nearly 90 deg. out of phase, the first maximum current occurring when the current and pressure are 180 deg. out of phase. This current rapidly falls to a minimum, then rises and gives a maximum about five or six periods after the first minimum.

The author wishes to record his indebtedness to Mr. H. Dickinson, city electrical engineer to the Liverpool Corporation, to Mr. Robinson and Mr. Breach, the assistant engineers, and to Mr. Hamilton, the engineer-in-charge at Lister Drive, for their help and co-operation in carrying out the tests at the various stations and sub-stations where the work has been done.

DISCUSSION.

Prof. J. A. FLEMING expressed his pleasure at being able to listen to such a paper, and congratulated the author on the way he had dealt with the subject. About 25 years ago he himself had commenced to investigate the matter, with the result that he was able to come to a complete understanding as to the cause and action of these surges. At that time, of course, they had not the facilities or apparatus with which to deal with the subject that they had to-day, and very little was known about the matter at all. One experiment he had made with a transformer was to use a glow lamp so adjusted that under normal conditions it was just on the point of glowing. The transformer was then switched in and out several times in succession, with the result that every now and again the lamp would flash up and so indicate when the surges occurred. He had also used a Braun tube, and a third apparatus consisted of a stick of wood at each end of which was attached a flat wooden disc, one of which was placed against the transformer, and the other against the ear, as a sort of stethoscope. In this way the surges could be distinctly heard when they took place in the transformer. He thought that these surges were due to the undesirable state in which the iron was left when the transformer was switched off. He would like to see more work done on this subject, and that it should be extended to embrace switchgear, so as to eliminate if possible the surges and sparks which occurred when switchgear was opened and closed.

Mr. A. R. EVEREST said he had greatly enjoyed the paper, but he was not quite prepared to discuss the subject. It was possible that these surges might cause danger, or bring about troubles when switching in or out occurred. He would like to ask what measures, if any, could be suggested which would prevent the transformer iron being left in an undesirable condition as mentioned by the previous speaker.

Prof. J. T. MORRIS remarked that in the records taken on switching in induction motors by the author, only current rushes had been considered, but there existed also pressure surges, which were more dangerous. He was greatly interested to hear of the experiments carried out by Prof. Fleming in connection with current rises in transformers. He knew of a case where a moving coil, central zero, D.C ammeter had been used on an A.C. circuit in such a way that the current was passed through the shunt of the ammeter. When normal the pointer vibrated slowly, but when a surge occurred it was at once indicated by a violent swing of the pointer. These surges, he had noticed, lasted for about 30 seconds with a 50-KW. transformer; with the lower frequencies and higher flux densities in use now these effects would be very much more marked, and he thought these surges would last about 10 minutes. He would like to know how long the author thought such surges would be likely to last.

Mr. H. BRAZIL was greatly interested in the paper, and mentioned records showing pressure surges which he had taken during the last 15 years. He described a horn arrester apparatus which he had designed himself, which, by sparking across the horns, showed when these surges occurred, but, unfortunately, it did not indicate their magnitude. An interesting fact was that rushes occurred between two sections of bus-bars; it was astonishing what a difference a short length of cable connected between the sections would make. With a length of 25 ft. of paper cable there was no appreciable rush, but with the same length of rubber cable a rush of 25 per cent. occurred. In the case of an induction motor being switched in an undoubted rush of current took place, as indicated by a spark between the horns of his apparatus, and also by a spark passing between the rotor and stator of the motor.

Prof. G. W. O. HOWE expressed his appreciation of the paper, and congratulated the author upon it; he said that only those who had actually used an oscillograph could appreciate the amount of painstaking work the author must have put into the paper. There was not much information to be found on the subject dealt with by the author, and the few papers in which such information was given, owing to the patriotic attitude of those in charge of our libraries, were not at present accessible. With reference to fig. 4, he said the amplitude remained the same, and it was the ratio that differed. As to induction motors, the copper in the rotor acted as a screen, and the same rush took place independently of the speed of the motor.

Mr. TAYLOR, referring to the same figure, said that the surge was not so serious as might be thought; it would be very much more serious if cables had no capacity, and therefore were not able to discharge the energy stored up in them, which would result in a general destruction of switchgear.

Mr. C. H. WORDINGHAM, President, said that many years ago he had similar experiences to those to which both the author and Prof. Fleming had referred. These surges were due to the state in which the iron was left when the transformer was shut down. It was not generally appreciated how great these surges could be at times; he had known them to be so great that the transformer actually jumped off the floor.

Prof. E. W. MARCHANT, replying, said that in a way he ought to apologise for presenting his paper, as it did not profess to put forward anything that was new. He was sorry he had not mentioned Prof. Fleming's and the President's work of 25 years ago. The problem of current rushes in transformers was becoming of great importance; there was far too little information on the question in connection with oil switches, and those who had the facilities ought to make as many tests as possible, which would be the means of gaining much knowledge on the subject. He thought the D.C. ammeter method described by Prof. Morris was of much interest; it was a very simple way of measuring the duration of these current surges. Under many conditions the surge effects would last a considerable time, possibly as long as 30 minutes, as indicated by the hum which was to be heard in transformers. The surges which occurred in induction motors were of great importance, but there was not much information about them to be had.

Synthetic Petrol.—In a paper read recently before the American Electrochemical Society, Mr. L. B. Cherry, an electrical engineer, gave some details of a process invented by him for producing synthetic petrol. The principle is to produce the chemical union of a gas, such as natural gas, composed largely of methane or hydrogen, with a hydrocarbon such as paraffin. It is claimed that, by subjecting the gas and paraffin vapour to a high-frequency, high-pressure electrical current, it is possible so to reorganise the molecules that a motor fuel of a petrol nature is obtainable.

Industrial Committees.—The *Times* states that the National Alliance of Employers and Employed is making special efforts to establish Joint Committees of employers and employed in Nottingham, Stafford, Bradford, Keighley, Liverpool, Edinburgh, Dundee, Glasgow, and Aberdeen.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

FRANCE.—Among recent decisions issued by the Customs Department regarding the classification of certain articles under the French Tariff, are the following :—

Article.	*Classification.*
Electric accumulators, complete, for pocket electric lamps, { With box or jar of celluloid or similar material.	Small wares *tabletterie* of celluloid or similar material.
{ Other	576 *ter.*—Electric accumulators and detached parts.
Dynamo brushes made of an alloy of copper and graphite	536.—Dynamo armatures and detached parts.
Metal electrodes for soldering metals consisting of a rod or wire of iron covered with asbestos	535 *ter.*—Wires insulated for electricity composed of cores of iron, steel, &c., according to the diameter.
Pocket electric lamps covered with celluloid.	641 *bis.*—Small wares of celluloid.
Machines and apparatus for working and fashioning metals.	NOTE.—Saving disposition to the contrary, magnetic apparatus, with which certain machines are sometimes provided, are to be assessed for duty separately as electro-technical apparatus.

SOUTH AFRICA.—The following are among decisions recently issued by the Commissioner of Customs :—

	Rate of import duty.	Rebate on goods manufactured or produced in the United Kingdom and reciprocating British Colonies.
Brazing spelter (brass fittings) ..	20 % *ad val.*	3 % *ad val.*
Bronze foil	3 % „	The whole duty.
Granulated lead	20 % „	3 % *ad val.*
Merrilite (zinc dust)	3 % „	The whole duty.

NICARAGUA.—As from November 18th last, the Nicaraguan Consular fees have been increased by 50 per cent. in each case, with the exception of the fees chargeable for the Consular *visa* on invoices, which are fixed as follows :—

Value of goods.	Cordobas.
Not exceeding 100 cordobas	2·50
Exceeding 100 but not exceeding 200 cordobas	3·00
„ 200 „ „ „ 500	5·00
„ 500, one cordoba for each 100 cordobas or fraction thereof in excess of 500 cordobas.	

(Cordoba = 4s. 2d.)

BASUTOLAND, BECHUANALAND PROTECTORATE, AND SWAZILAND.—Proclamations have been issued providing that the increased Customs duties imposed in 1915, and re-imposed in 1916, are again re-imposed with a few exceptions, and will continue in force until June 30th, 1918, thus bringing the respective Tariffs of the above-mentioned Territories into line with the Union Tariff. (For particulars as to the electrical goods affected, see the ELECTRICAL REVIEW of September 15th, 1916.)

ITALY.—A Decree making provision for the payment of Customs duties in paper currency has been promulgated in the official *Gazette* of November 26th. As from that date, and until six months after the conclusion of peace, the sums payable in gold in respect of Customs duties may be paid direct to the Customs in paper currency with the addition of 50 per cent. of the amount payable.

The Minister of the Treasury is authorised to vary, by Decree, the amount of the percentage addition to be collected when Customs duties are paid in paper currency.

Amounts not exceeding 50 lire may be paid in silver dollars (*scudi*), and for sums not exceeding 5 lire the Customs are authorised to accept divisional silver Italian currency, or "buoni di cassa," without any addition.

The Decree suspends, during the period indicated above, all previous provisions relating to the delivery, by the banks of issue, of certificates for the payment of Customs duties against the deposit of paper currency for the amount due on the basis of the exchange rate fixed by the Minister.

UNITED STATES OF AMERICA.—The importation (except under licence) of the following among other articles into the United States has been prohibited by the President's Proclamation of November 28th :—Antimony and antimony ore, asbestos, chrome and chrome ore, cobalt and cobalt ore, ferro-alloys of all kinds, gutta-joolatong, gutta-percha, guttasiak, balata, rubber (raw, reclaimed, waste or scrap), manganese and manganese ore, mica, molybdenum and molybdenum ore, nickel and nickel ore, platinum, plumbago, tin in bars, &c., tin ore and tin concentrates, titanium and titanium ore, tungsten and tungsten ore, vanadium and vanadium ore, and wolframite.

H.M. Ambassador at Washington has notified the Foreign Office that export licences are not required in the case of goods, of kinds prohibited to be exported from the United States, which arrive in ports of the United States under through bills of lading, and are there transhipped for ultimate destination in the United Kingdom, or a British Dominion or Possession.

Export licences *are* required in respect of consignments of export-prohibited goods which are shipped from the United Kingdom on through bills of lading for transhipment in a United States port to a foreign destination (*e.g.*, South or Central America). It is, however, anticipated that the United States authorities will grant such export licences freely.

NEW PATENTS APPLIED FOR, 1918.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

7,964. "Electric couplings and bases combined." R. W. BELL & W. T. BOWER. May 13th.

7,974. "Sound-amplifying device for telegraph relays." C. F. HILTON. May 13th.

7,978. "Trolleys or collectors for electric tramways, &c." E. R. THOMAS May 13th.

7,985. "Signalling training." H. W. SCOTT. May 13th.

7,988. "Electric cut-outs" R. E. RAVEN. May 13th.

7,990. "Sparking-plug holder." W. OWEN & O. WILLIAMS. May 13th.

8,002. "Electric motor-control systems." BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. AND L. MILLER. May 13th.

8,029. "Magnetos." COMPAGNIE GENERALE DE MAGNETOS. May 13th. (France, October 1st, 1917.)

8,036. "Flange joints for electric arc welding on thin materials." F. BLOMLEY. May 14th.

8,038. "Electric water heaters." L. O. MEYER. May 14th.

8,047. "Dry non-acid accumulator." L. G. DAVIES. May 14th.

8,065/8,070. "Electric relays." A. C. HEAP. May 14th.

8,066. "Sound-detecting devices." A. C. HEAP. May 14th.

8,069. "Electric relays or switching devices." A. C. HEAP. May 14th.

8,081. "Electric generators." R. D. HOLT. May 14th.

8,082. "Magneto-electric ignition apparatus." D. Y. WHEATLEY. May 14th.

8,084. "Sparking plugs." J. M. E. FRANC. May 14th.

8,094. "Electric filament lamps." A. COPELIN & EDISON SWAN ELECTRIC CO. May 14th.

8,109/8,117. "Devices for locking electric lamps in bayonet-catch holders." W. A. MADDICK. May 15th.

8,118. "Brushes, &c., for electrical machinery." C. A. MILLER, F. J. MILLER & E. A. SANDERS. May 15th.

8,129. "Cells for secondary batteries." H. R. PERASON. May 15th.

8,133. "Antennæ for wireless signalling." BRITISH THOMSON-HOUSTON CO. (General Electric Co., U.S.A.) May 15th.

8,143. "Wireless telegraphic receiving apparatus." W. J. LYONS & SELECTIVE SIGNAL CO. May 15th.

8,161. "Miners' safety, &c., electric lamps." G. OLDHAM & J. OLDHAM. May 15th.

8,162. "Galvanic batteries." G. OLDHAM & J. OLDHAM. May 15th.

8,164. "Electric contacting devices." A. C. HEAP. May 15th.

8,168. "Electric lampholders." C. G. BENNETT & H. GARDE. May 15th.

8,169. "Electric switches." C. G. BENNETT & H. GARDE. May 15th.

8,176. "Charging boards for electric accumulators." H. LEITNER. May 15th.

8,182. "Electric light stick." E. A DAVIS. May 16th.

8,188. "Contact-breakers on magnetos." W. TURNER. May 16th.

8,200. "Rotary electric machines." K. NOBUHARA. May 16th. (Japan, May 16th, 1917.)

8,201. "Electric stamping or pulverising machines." A. C. BASBE & R. E. SMART. May 16th.

8,207. "Electrolytic gas generators." I. H. LEVIN. May 16th. (U.S.A., May 22nd, 1917.)

8,220. "Electrotherapeutic apparatus." H. NETTER. May 16th. (France, May 16th, 1917.)

8,224. "Electrical precipitation." D. K. MORRIS & F. H. HAVILAND. May 16th.

8,226. "Control of alternating-current electric motors." J. ANDERSON AND G. ELLISON. May 16th.

8,227. "Junction boxes for electric circuits." H. E. WALKER. May 16th.

8,242. "Protection means for terminals of electric batteries." BRITISH EVER-READY CO. & A. H. SHEPPARD. May 16th.

8,273. "Electric induction furnaces." O. C. BOCKMAN. May 17th. (Norway, October 12th, 1917.)

8,287. "Radio-signalling system." L. DE FOREST. May 17th. (U.S.A., June 16th, 1917.)

8,290. "Electro-magnetically-controlled signal reverser for railways. R. W. TARRANT & W. R. SYKES INTERLOCKING SIGNAL CO. May 17th.

8,293. "Electric heating stoves." SOC. ANON. HECLA & H. A. COPE. May 17th.

8,300. "Electric dynamos." D. SUCHOSTAWER. May 17th.

8,318. "Audion or lamp relay or amplifying apparatus." M. LATOUR. May 17th. (France, October 23rd, 1916.)

8,324. "Electric engraving pencils." R. I. ELECTRICAL INSTRUMENT CO. AND A. M. ROBINSON. May 17th.

8,331. "Conductors for electric current." C. O. BASTIAN. May 17th.

8,334. "Dynamo-electric machines." G. FEYER & PORTABLE ELECTRIC MOTORS, LTD. May 17th.

8,348. "X-ray localisation." SIR J. M. DAVIDSON. May 17th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

8,150. CONTINUOUS-CURRENT DYNAMOS. F. Kesselring. June 8th, 1916. (115,045.)

17,593. APPARATUS FOR OPERATING DOOR BOLTS AND THE LIKE BY ELECTRICAL MEANS. E. C. R. Marks (Suddeutsche Telefon-Apparate Kabel und Drahtwerke Akt. Ges.). December 7th, 1916. (115,050.)

1917.

5,815. MINERS' ELECTRIC LAMPS. J. Davis & Son and W. H. Davis. April 25th, 1917. (115,084.)

6,094. SYSTEMS OF ELECTRIC MOTOR CONTROL. British Thomson-Houston Co. (General Electric Co., U.S.A.) April 30th, 1917. (115,089.)

6,285. ELECTRIC WELDING APPARATUS. W. J. Mellersh-Jackson (T. E. Murray). May 3rd, 1917. (115,105.)

6,364. MEANS FOR AUTOMATICALLY RECORDING CALLS IN TELEPHONE SYSTEMS. A. E. Woods. May 4th, 1917. (115,107.)

6,802. PHASE CONVERSION OF ALTERNATING ELECTRIC CURRENTS. British Thomson-Houston Co. (General Electric Co., U.S.A.) May 12th, 1917. (115,112.)